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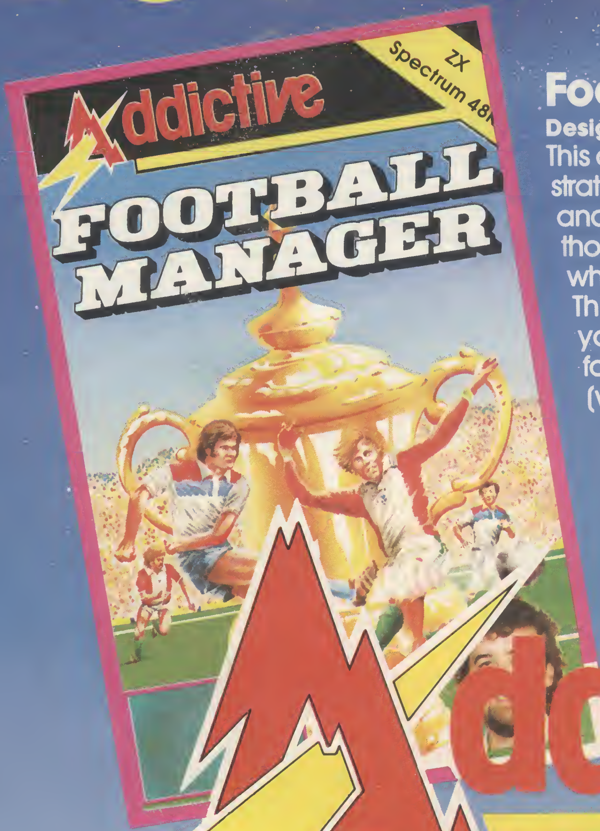

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Addictive

*ZX81 Chart,
Home Computing Weekly 16.8.83

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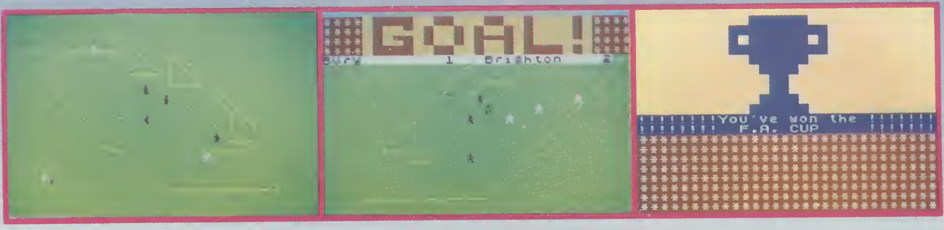

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MPUTING

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ZX Computing is constantly on the look-out for well-written articles and programs. If you think that your efforts meet our standards, please feel free to submit your work to us for consideration.

All submitted material should be typed if possible; handwritten work will be considered, but please use your neatest handwriting. Any programs submitted should be listed, a cassette of your program alone will not be considered. All programs must come complete with a full explanation of the operation and, where relevant, the structure; Spectrum programs should be accompanied with a cassette of the program (which will be returned) as well as the listing.

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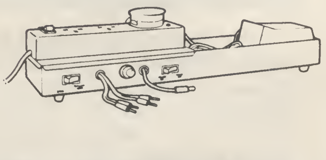

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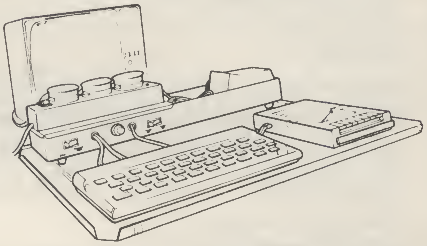

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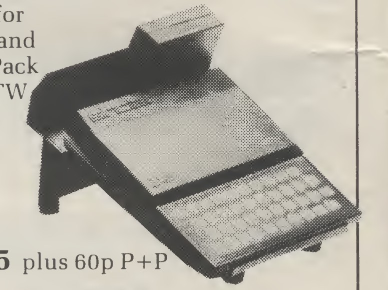

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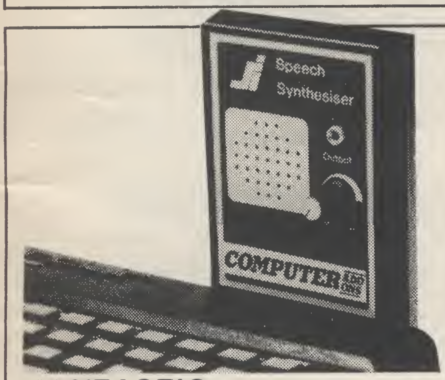

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Welcome

Welcome to our Christmas edition of ZX Computing. And have we got an issue for you — as well as all the usual features and programs, there are some special features which you may find useful when doing your Christmas shopping for yourself. Go on, treat yourself — after all, Christmas comes but once a year.

And speaking of events that happen once a year, did any of you trek up to the Barbican to see the PCW show. Although not based solely on any one micro, there were many Sinclair-related stands in evidence. There were also some very important people wandering around amongst the visitors — one, Sir Clive Sinclair, caught my eye rushing from stand to stand looking at the new products on the stands.

The Sinclair Research stand was buzzing, especially as it was the launch day of their ZX Interface 2 unit as well as a dazzling array of new software for the ZX Spectrum. With a number of sample Spectrums loaded up and ready to play, there were a great number of prospective users trying their hand at the new games.

Other stands included Quicksilva, who were also basking in the glory of having released five new titles for the ZX Spectrum. Happiest of all seemed Mark Eyles, who's thankless (!) task was to demonstrate some of the new software. No, I'm joking really — he was having the time of his life, even if he wasn't that good at the games! But for more information on Quicksilva's new releases, have a look at the Software news pages.

Also at the show was Tim Hartnell fronting the Interface Publications stand. Bubbling over with his usual enthusiasm, Tim was very excited about three of his new publications in particular which deal with learning machine code on the Spectrum — maybe we'll have a chance to review them in a future Bookshelf.

Within these pages . . .

Just to give you a flavour of the contents of this issue, I'll try and whet your appetite. Perhaps this issue, there is a slight concentration on games programs, although there is the odd sprinkling of business and utility listings. As far as games go, there is a great game called Nuclear attack. Based on the arcade games of 'Missile Attack', this is a splendid adaption for the 48K Spectrum.

Complete with great explosions and missilies flying all over the screen, this program should keep you busy for hours and hours over the holidays. And speaking of such an ominous subject, have you seen the film 'War Games' which is currently on general release in your local cinemas? If you haven't, I can thoroughly recommend it as a very exciting film and one with a very thought-provoking ending. A film that will definitely make you think more about the games which are so popular on home computers!

There are, of course, a large number of great programs for you to type in in this issue, including a wide selection of 16/48K programs for your ZX Spectrum and 1/16K listings for your ZX81. I hope you enjoy them.

And the rest . . .

I have included a large number of reviews in this issue and have drawn upon the talents of all our regular reviewers for this task. James Walsh has been sifting through a wide selection of Spectrum software for The soft touch, and Nick Pearce has been equally busy with his ZX81 soft selection. And together, they have picked three software packages for the Spectrum and ZX81 which they think have been outstanding 'software successes' of 1983. You'll find their thoughts in an article called The best three of '83.

Peter Shaw has also been doing a little overtime on this issue so that in addition to his helpful hints in Problem page, he has looked at two areas of Spectrum software that we have not really touched on to closely in the past. The first, Educating, Peter?, despite the whimsical title, is a look at pre-school software. And his other article, titled Seriously now, looks at a number of 'serious' software packages. I'd also like to welcome back Paul Holmes who has taken a look at some software to help you choose some suitable gifts for the Christmas stocking.

Specially . . .

There are two special features this edition. The first, a continuation from the last issue, is a list of Spectrum software available on the market. The list is supported by an index of addresses of suppliers for all the titles featured in the checklists. If you can't manage to find a package there that will suit you for the Christmas holidays or a suitable present for a friend, then you're just not trying hard enough!

The other feature this issue is concerned with hardware add-ons for the ZX81 and ZX Spectrum. Providing a 'shop window', it will hopefully give you a rough idea of how you can improve your micro system without giving your wallet too much of a shock.

Contributions

We are always on the lookout for good programs and articles for future issues of *ZX Computing,* and where better to look than to our own readers. If, when reading through the magazine, you think you can write programs as well, or better than, our present contributors, then let's hear from you.

All contributions are, of course, paid for at very competitive rates. So if you've got you eye on a new ZX add-on or you'd just like to supplement your pocket money, get writing! It is vital, though, that all the programs you send us are totally original, and not 'borrowed' or 'adapted' from other magazines or books. (When Tim Hartnell was siting in the Editor's chair, he even received 'original' contributions he himself had written for his own books!)

Any kind of program (business, domestic, educational, or just fun) will be welcomed, but particularly those which use ZX BASIC in clever and efficient ways, or those which employ certain routines which can be re-used on other programs.

Program listings are vital, along with a clear explanation of how the program is constructed, what it does and what the user can expect to see once the program is RUN (a screen dump is particularly valuable in this respect). When submitting Spectrum programs, it is very important to remember to enclose a cassette of the program as well as the listing, as this will allow us to check the program before publication.

And so . . .

. . . this is Christmas, as the old (but gold) John Lennon classic went, I hope you all have a marvellous time over the holiday, but don't forget now — make more of your micro with *ZX Computing*. And if it doesn't seem to daunting — see you all in 1984.

Roger Munford

Play your cards wrong?

Dear ZX Computing.
I typed in the program in the Aug/Sept issue of your magazine called Play your cards right. Great game, shame about line 970!

Unfortunately, it seems as if part of the line was obliterated and so becomes impossible to input into the computer. However, I managed to find the problem, which is nothing more than a missing division sign, and the line should read:

```
970 LET odds=INT
((v/((bet+buy)/(amt/5)))/
50)+1
```

I hope this clears up any problems some of your readers might have been having with the program.

Sue Denham,
London SW16.

Bug alert

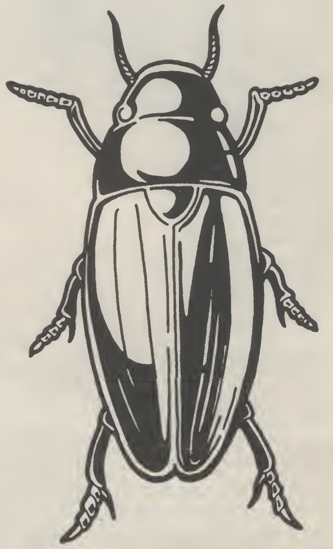
Dear ZX Computing,
I have now been the proud owner of a ZX81 with 16K RAM for just over a month now, and two weeks ago I bought my first ever issue of *ZX Computing* — the Aug/Sept issue, in fact.

Since then, I have had many fun-filled hours of shooting down enemy spy 'planes in . . . yes, you've guessed it . . . Stephen Smith's Reconnaissance alert. But I could not understand why I kept getting a great deal of enemy aircraft on the screen at once. You see, the enemy kept leaving shadows of themselves on the screen.

Eventually I managed to trace the error to line 415, in which the '10+B' should in actual fact be altered to read '10+D'. This then gives one 'plane which rubs itself out as it moves, instead of leaving a trail of exact replicas behind!

I hope my small correction helps to make the enjoyment of a superb game even better.

Yours faithfully,
Neil Wright,
Notts.



The generation game

Dear ZX Computing.
I wonder if any of your readers are interested in a small pattern generator I wrote on my ZX81. The program shown in Fig. 1 produces random patterns, such as that shown in Fig. 2.

You can, however, modify the program to produce a more specific style of pattern, and this program is shown in Fig. 3. You can alter the type of pattern produced by varying the values of A$, Y or X. Also, if you want to make a copy of the patterns you make, you should add the following two lines to your program:

```
280 IF INKEY$ = "" THEN
GOTO 280
285 IF INKEY$ = "Z" THEN
COPY
```

Hope your readers have some fun with these listings.
Yours faithfully,

BJ Funnell,
Watford.

Fig. 2.

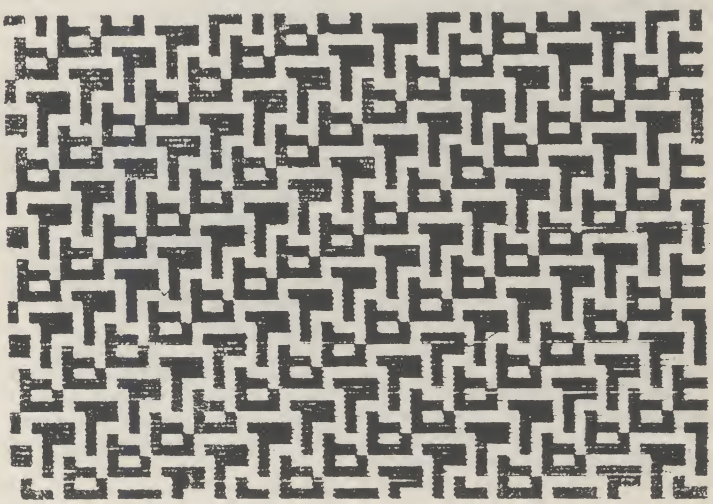
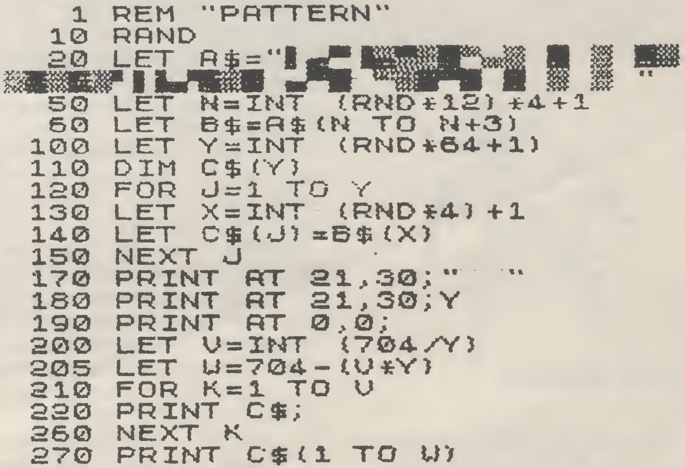


Fig. 1.

```
  1 REM "PATTERN"
 10 RAND
 20 LET A$="▌▄▀▐"
100 LET Y=5
110 DIM C$(Y)
120 FOR J=1 TO Y
130 LET X=INT (RND*4)+1
140 LET C$(J)=A$(X)
150 NEXT J
170 PRINT AT 21,30;"  "
180 PRINT AT 21,30;Y
190 PRINT AT 0,0;
200 LET V=INT (704/Y)
205 LET W=704-(V*Y)
210 FOR K=1 TO V
220 PRINT C$;
260 NEXT K
270 PRINT C$(1 TO W)
290 GOTO 100
```

Fig. 3.



```
  1 REM "PATTERN"
 10 RAND
 20 LET A$="[illegible]"
 50 LET N=INT (RND*12)*4+1
 60 LET B$=A$(N TO N+3)
100 LET Y=INT (RND*64+1)
110 DIM C$(Y)
120 FOR J=1 TO Y
130 LET X=INT (RND*4)+1
140 LET C$(J)=B$(X)
150 NEXT J
170 PRINT AT 21,30;"  "
180 PRINT AT 21,30;Y
190 PRINT AT 0,0;
200 LET V=INT (704/Y)
205 LET W=704-(V*Y)
210 FOR K=1 TO V
220 PRINT C$;
260 NEXT K
270 PRINT C$(1 TO W)
290 GOTO 50
```

Getting in tune

Dear ZX Computing,
Referring to your 'Guitar chord' program in the Aug/Sept issue of *ZX Computing* where you say 'now if only someone could write a program to tune the guitar'' — look no further!

I have written a program, marketed by Lasersound Ltd, which use the Spectrum's sound and graphics to help you tune your guitar. In addition, 48 chords can be displayed in a similar way to the sample screen shown to illustrate the program in your magazine.

You can also access a table of tonic, sub-dominant, dominant and relative minors, and transpose a tune into the key of your choice. Finally, there are a selection of traditional folk songs for you to accompany.

My program works on both the 16K and 48K Spectrums (Spectra?) and is available for £6.00 from Lasersound Ltd, Stratford Workshops, Burford Road, London E15.
Yours faithfully,

J Douglas Barr,
Paisley,
Scotland.

Bug bound

Dear ZX Computing,
I have just purchased a copy of the Aug/Sept edition of ZX Computing and, fame at last, I saw that you had published my 1K dice program as part of the 1K Corral.

However, there are mistakes in three lines as published — you have managed to miss out all the graphics. Also, there is a semi-colon missing from line 10.

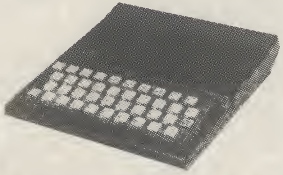
Here below are the three relevant lines as they should have been published:

```
5 PRINT AT 9,T-PI;''▙▄▄▄▄'' — (Graphic shifted 3, 3 × Graphic shifted 6
6 PRINT AT 9+S,T-PI;''▯███'' — (Graphic shifted 8, 3 × Graphic shifted spaces)
10 PRINT AT 11,T-I;''▟'' AND S-2*INT (S/2); AT 10,T;''▟'' AND S I; AT 12,T-2;''▟'' AND S I; AT 10,T-2;''▟'' AND S PI; AT 12,T;''▟'' AND S PI; AT 11,T-2''▟██▟'' AND S=6
```

(this line includes Graphic shifted Qs and one Graphic shifted space)

With the graphics in correctly, plus the semi-colon, the program should run perfectly.
Your faithfully,

Colin James,
Clwyd.



What a load of rubbish!

Dear ZX Computing,
I am writing to tell you what I think is a bug in the ZX Spectrum. Try typing this in:

```
10 PRINT "(any amount of characters you like)"
20 GOTO 10
```

When asked 'scroll?' press Caps Shift and Symbol Shift together. The word 'RUN' appears. Now press Enter. The whole screen will fill with rubbish (pig-latin?).

If you follow the same procedure, the same thing happens each time — but if you press another key, the screen prints another half page and stops with 'error k invalid colour'. Also, whatever state the cursor was in will scroll up the screen (be it K, L, E, G or C). The screen will be full of blanks if you used a null string in the above program.

I would be very interested if any of your readers could offer any explanation for this mysterious occurance.
Yours faithfully,

Raymond Clune,
Essex.

Service with a smile

Dear ZX Computing,
I recently bought a Hitachi 14 inch colour TV being already in posession of a 48K Sinclair Spectrum and was most surprised and dismayed to receive only black and white pictures.

The retailer, Landau Electronics of Sutton, was contacted. The young salesman walked me to their television shop several doors down the High Street. He then:

(a) Checked my Spectrum with a similiar T.V. in the shop.
(b) Checked a new Spectrum with the T.V. (In all cases no colour).
(c) Used a new mains adaptor.

He then walked all the way back to the shop and returned with four of five more Spectrums. He tested two or three more and surprise, we had colour. He exchanged my Spectrum and mains adaptor for the latter Spectrum and adaptor for me at no charge and as I walked out of the shop he made the parting remark that I should be OK now, but if not, to come back and he would test some more machines.

What after sales service! I had to bring it to your attention and hope that you can see fit to publish this letter.
Yours faithfully,

LEJ Fraser,
Surrey.

Serially . . .

Dear ZX Computing,
Here is a programming method for putting a serial number to one of a set of strings. This has arisen in your letters in the form of converting a string C$ = "2" or "3" or . . . or "9" or "T" or "J" or "Q" or "K" or "A", representing a playing card, to a number C from 2 to 14. Here is a test program to illustrate an efficient method:

```
10 INPUT C$
20 FOR C=2 TO 14
30 IF C$<>"23456789TJQKA"(C-1) THEN NEXT C
40 PRINT C$;" ";C
```

If C$ does not represent a card, C takes the value 15. There is a certain resemblance to the solution of ADV Barnett (Aug/Sep 83), but this is shorter.

The technique has many applications. A more elaborate example derives M, the month in figures (1-12), from M$, the name of the month, abbreviated, if desired, to its first three letters.

```
10 INPUT M$
20 FOR M=3 TO 36 STEP 3
30 IF M$(TO 3)<>"JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"(M-2 TO M) THEN NEXT M
40 LET M=M/3
50 PRINT M$; " ";M
```

A non-existent 'month' puts M=13.
Yours faithfully,

WE Thomson,
Suffolk.

Strange . . . but useful

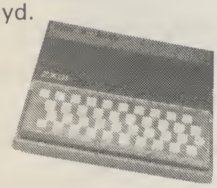
Dear ZX Computing,
In response to Toby Philpott's letter in your June/July issue concerning the queer results on entering certain 'RAND USR' instructions on the 16K ZX81, I typed them in. Needless to say, the stated 'strange codes' occurred, but I couldn't help wondering as to what use these could be put so I set about finding some which would be more useful (say) to a machine code programmer.

Here are the routines with their decimal address and also their BASIC equivalent (if any):

3875	FAST
3086	SCROLL
1476	Equivalent to 'EDIT'
930	Equivalent to 'BREAK'
✱757	SAVE
✱833	LOAD
2955	Equivalent to ',' in 'PRINT'

A star by the number indicates that the computer must be in 'FAST' mode beforehand. The 'LOAD' instruction is the one I find most useful as it allows me to make back-up copies of any of my friend's games so I could check out how they worked!
Yours faithfully,

Gary Threadgold,
Clwyd.



Calculating confusion

Dear ZX Computing,
When the question of calculating memory addresses from binary is discussed, most books suggest the use of a calculator or a computer to do the calculation, ie multiplying the msb (most significant bit) in binary by 256. I used to keep a scrap pad for the calculations but found it was too distracting, particularly since one needs to concentrate on detail when assembling or disassembling machine code and distractions can be fatal to the program.

I found it much more convenient to write a 256 times table giving the msb values for one to 256 times 256. Since it was essential to get it right, I checked it on a 48K Spectrum with the following program:

```
10 LET y=256
20 FOR n=0 TO 255:
   PRINT n*y
30 NEXT n
```

The program is easily converted for almost all other home computers.
Yours faithfully,

JD Sparke,
Cleveland.

Very interesting . .

Dear ZX Computing,
One night when I was playing with my ZX81, I discovered something very interesting on my computer.

I had accidently pressed the 'V', 'B' and Shift keys at the same time and the computer gave the report code 'D/25'. I tried pressing the same keys again but with a different program, but again I got a report code saying I had pressed the Break key.

So, if you want to stop a program without pressing the Break key, try pressing the 'V', 'B' and Shift keys together.
Yours faithfully,

Kenneth Meade,
Sunderland.

Pen pal?

Dear ZX Computing,
Having just obtained my first copy of *ZX Computing*. I eyed the Club corner rather jealously. What an abundance! I'm not a member of any ZX clubs over here, mainly because there aren't any.

However, I would very much like to correspond with some of your readers, to exchange programming tips, news, programs, etc.

I operate a ZX81 with 32K and ZX Printer. Any interested parties, please write!
Yours faithfully,

Tony LaRou
2345 Northfield
Trenton, MI 48183
USA

Ghost in the machine?

Dear ZX Computing,
While writing a machine code program for my ZX81 I noticed a 'bug' in the part of the Interpreter concerning the function INKEY$.INKEY$ produces the character of the key presently being depressed. However, if more than one key is being depressed, the Interpreter 'gets confused' and returns an empty string. So, when I tried this:

```
10 IF INKEY$<>"" THEN
GOTO 10
20 RAND USR 16514
```

The system crashed if more than one key was being depressed.

Further investigations revealed that the ZX81 retrieves information from the keyboard via two 'networks', shown in Figs. 1 and 2. The Interpreter works by loading the result of its keyboard scan into bytes 16421 and 16422, the system variable LAST_K. If byte 16422, the high byte, is equal to 255 then all bits are on and no key is depressed. If not, then it looks up which bit in 16422 is off. It then checks if a bit in the low byte is off, and decides which key is depressed, since the result is unique to that particular key. However, if more than one key is depressed, then the bit situation is mixed up and the method normally used does not work. It is then impossible to tell which keys are depressed. The Interpreter gets past this sticky situation by returning an empty string.

It is therefore, possible to tell whether the empty string represents no keys being pressed or more than one key being pressed by checking the byte 16422 for 255, which means all bits are on and no key is being pressed. So, the replacement for line 10 is:

```
10 IF PEEK 16422<>255
THEN GOTO 10
```

One other problem is that of the Shift key alone being pressed. Normally, this is impossible to detect, but this can be solved using:

```
10 IF PEEK 16422=254
THEN PRINT ''SHIFT IS
PRESSED ON ITS OWN''
```

Note that although it is impossible to distinguish keys if more than one key is depressed, it is still possible to detect if a particular section is being pressed. This is put to good use in New Generation's 3D Defender game.
Yours faithfully,

Alastair McKinstry,
County Dublin,
Ireland.

Fig. 1.

High Byte (Peek 16422)

Section	Keys
1	1,Q,A,0,P, Newline and Space
2	2,W,S,Z,9,O,L,.
3	3,E,D,X,8,I,K,M
4	4,R,F,C,7,U,J,N
5	5,T,G,V,6,Y,H,B

RESULT:

	WITHOUT SHIFT	WITH SHIFT
No Key	11111111	11111110
Section 1	11111101	11111100
Section 2	11111011	11111010
Section 3	11110111	11110110
Section 4	11101111	11101110
Section 5	11011111	11011110

Fig. 2.

Low Byte (PEEK 16421)

Section	Keys
0	Z,X,C,V
1	A,S,D,F,G
2	Q,W,E,R,T
3	1,2,3,4,5,
4	6,7,8,9,0
5	Y,U,I,O,P
6	H,J,K,L,Newline
7	B,N,M,.,Space

RESULT:

	BINARY
No Key	11111111
Section 0	11111110
Section 1	11111101
Section 2	11111011
Section 3	11110111
Section 4	11101111
Section 5	11011111
Section 6	10111111
Section 7	01111111

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For advertisement appearing on page number 48/49

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DK Tronics Ltd., Unit 6, Shire Hill Industrial Estate,
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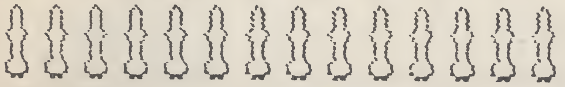
Nuclear attack



Defend the cities from the enemy missiles in this fabulous Spectrum simulation from Mathew Homer of Port Headland, Australia.

In this program, you are in charge of a nuclear missile site which has been constructed to defend six cities from sudden nuclear attack. And your job, thankless as usual, is to stave off the missiles so that the cities can be evacuated.

There are six cities in all to save, and from your nuclear base you have 30 surface-to-air missiles which you can launch at the on-coming missiles. However, watch out for your base because if that gets hit, you will lose all of your missiles.

You fire a missile by manoeuvering an 'X' around the screen and hitting the fire button. All the keys required to move the 'X' in any one of eight directions and fire your missiles are given as part of the instruction routine within the program.

Point to point

For each missile you shoot out of the sky, you will receive 1,000 points, and if you manage to save any of your cities after a barage of missiles you receive bonus points. Once you surpass 50,000 and 100,000 points, you get a bonus city to save.

Your only other real worry is that every now and then an aeroplane will move across the screen and drop a number of missiles. However, the 'plane is considerably lower than the enemy missiles usually start at, so it's best to take out the 'plane just as soon as you can — especially, before it unloads its deadly cargo!

One other small tip, but one I'm sure you'll soon get the hang of, is that it's best to aim your missiles a little before the enemy missiles, so that they actually run into the explosion.

Okay, have some fun — but remember, anything has got to be more fun than the real thing!

Line by line

Here follows a breakdown of the program, Nuclear attack, so that you should gain more of an insight into its intricacies:

Lines 2-62	Initialisation of the score and variables.
Lines 65-95	Determines the course and targetting of the new missiles.
Lines 100-995	Scan the keyboard and determine the movement of the missiles.
Lines 1000-2060	Control the movement of the sites and determine if the defence missiles are to be fired.
Lines 2100-2209	Decrease the rate of the barage against the cities, determine whether the attack has finished or if all the cities have been destroyed.
Lines 2210-2438	Form the scoreboard routine.
Lines 2500-2760	Form the bonus points routine.
Lines 3000-3170	Control the bomber and initialise the bomber's missiles.
Lines 4000-4130	Contain all the user-defined graphics.
Lines 5000-5200	Form explosions on the screen when missiles or bombers are hit by the defence's missiles.
Lines 6000-6049	Control the firing of the defending missiles.
Lines 6050-6078	Contain the instructions for the game.
Lines 6080-6120	The initial display which you see when the program is first run.
Lines 6130-6310	Control the setting-up of the screen and the setting-up of the missile sites when stocks are not all used up.
Lines 6330-6900	Control the drawing of the missile storage on the bottom of the screen.
Lines 7000-7150	Control the explosions of the defence's missiles.
Lines 7200-7620	Form the nuclear explosions and the mushroom cloud.
Lines 7985-8200	Eliminate the missile trails and/or the cities' locations, insuring that any new missiles will not aim at locations of already destroyed cities; these lines also calculate the loss of missiles if the defence site is hit.
Line 9005	The saving routine. To save the program on tape, simply type 'GO TO 9005'.

Typing tips

The following lines are ones which can be left out or replaced should you wish to type in the program in stages. Obviously, REM statements can be left out, but for your own piece of mind you may well be better off inserting a few here and there to give you an idea of how the program operates. Anyway, here are the areas of the program you can modify:

Lines 2210-2438	This routine forms the scoreboard, but could always be replaced with a STOP statement. The scoreboard routine could also be used in other programs, using SS as the score variable.
Lines 6080-6120	The display when the program is first run.
Lines 7268-7620	The nuclear explosion and mushroom cloud. These lines may be replaced by the far less spectacular routine shown in Fig. 1.

```
7268 FLASH 1: PRINT AT 19,tt;"▝▜▀
▀";AT 20,tt;"▜▖▚";AT 21,tt;"▙▄▟"
7270 FOR w=0 TO 30 STEP 10: BEEP
 .08,w: BEEP .08,25-w: NEXT w: F
OR w=1 TO 5: BEEP .1,-30: NEXT w
7275 FLASH 0: PRINT AT 19,tt;"
 ";AT 20,tt;"   ";AT 21,tt;"   "
7280 PLOT 0,0: DRAW 255,0
```

Fig. 1.

```
   2 LET xx=5: LET ss=0: LET pp=
12: INK 0: PAPER 5: BORDER 5: BR
IGHT 0: OVER 0: INVERSE 0: FLASH
 0: CLS : BEEP .5,30
   3 DIM g(7): LET mm=7: LET vv=
0: LET g(1)=28: LET g(2)=60: LET
 g(3)=92: LET g(4)=128: LET g(5)
=164: LET g(6)=196: LET g(7)=228
   4 LET ab=28: LET ss=0: DIM c$
(4,14): DIM c(3): LET c(1)=0: LE
T c(2)=0: LET c(3)=0: GO TO 6050
   5 REM Variables: a,b,c,d,e,f,
g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,w,
x,y,z
   6 REM Variables: z$,aa,bb,cc,
dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn
```

▶

```
,oo,pp,qq,rr,ss,tt,uu,vv,ww,xx,y
y,zz
   7 REM Variables: ab,ac,ad,ae,
af,ah,ai,aj,ak
  10 GO TO 4000
  11 OVER 0: INK 7: PAPER 0: BOR
DER 0: INVERSE 0: FLASH 0: BRIGH
T 1: CLS . GO TO 6000
  14 REM
  15 REM   "Nuclear Attack"
  16 REM    Written By....
  17 REM    Matthew Homer
  18 REM         ©1983
  19 REM
  28 IF ss<0 THEN LET ss=0
  29 BEEP .5,30
  30 DIM z(30): DIM m(30): DIM q
(30): DIM i(11,2): DIM a(11): DI
M d(11): DIM e(11): DIM f(11)
  34 LET ad=0: LET yy=0: LET t=0
: LET rr=0: LET kk=9: LET ll=12:
 LET nn=0: LET oo=125: LET qq=14
  35 LET aj=0: LET jj=6: LET ii=
0: LET aa=1: LET cc=1: LET dd=0:
 LET ee=1: LET ff=1: LET gg=1: L
ET hh=1: LET bb=0: LET s=0: LET
b=0: LET p=0
  37 PRINT AT 0,10;"
    "; OVER 1; INK 9;AT 0,10;"SC
ORE ";ss
  40 RANDOMIZE
  50 PLOT 127,0
  60 LET x=16: LET y=10
  61 LET c=20: LET n=20
  62 PRINT OVER 1;AT y,x;"X"
  65 IF yy>=ab THEN LET ii=1
  66 IF b>jj THEN GO TO 2100
  67 LET b=b+1
  68 IF b>10 THEN LET b=b-1
  69 IF b>10 THEN RETURN
  70 LET yy=yy+1
  71 LET f(b)=INT (RND*10)-4
  73 LET d(b)=9((INT (RND*mm))+1
)-175*(f(b)/5)
  75 LET e(b)=175
  82 LET i(b,1)=d(b): LET i(b,2)
=e(b)
  90 IF d(b)<0 OR d(b)>255 THEN
GO TO 71
  95 IF b>1 THEN RETURN
 100 OVER 0
 101 IF b=0 OR mm=0 THEN GO TO 2
200
 102 IF RND>ii THEN GO SUB 65
 110 FOR a=1 TO b
 115 IF e(a)<5 THEN GO TO 7200
 120 PLOT d(a),e(a): DRAW f(a),-
4
 130 LET e(a)=e(a)-5: LET d(a)=d
(a)+f(a)
 131 IF ad=1 THEN GO TO 3050
 132 LET k=1: IF POINT (d(a),e(a
)-1)=1 AND ATTR ((175-e(a))/8,d(
a)/8)=pp THEN GO TO 8000
 135 IF IN 65278<253 OR IN 64510
+IN 65022+IN 57342+IN 49150<1020
 THEN GO SUB 1000
 140 NEXT a
 150 IF RND>.9 THEN GO TO 3000
 990 IF IN 65278<253 OR IN 64510
+IN 65022+IN 57342+IN 49150<1020
 THEN GO SUB 1000
 992 IF bb=1 THEN RETURN
 995 GO TO 100
1000 LET c=x: LET n=y
1010 LET x=x+(IN 64510=251)
1020 LET y=y-(IN 57342<255)
1030 LET x=x-(IN 64510=253)
1035 LET y=y+(IN 49150<255)
2000 IF x<0 THEN LET x=0
2020 IF y<0 THEN LET y=0
2030 IF y>20 THEN LET y=20
2040 IF x>31 THEN LET x=31
2045 IF c=x AND n=y THEN GO TO 2
050
2046 OVER 1: PRINT AT y,x;"X"
2049 OVER 1: INVERSE 0: PRINT AT
 n,c;"X": INVERSE 0: OVER 0
2050 IF IN 65278<253 THEN GO SUB
 6000
2060 RETURN
2100 LET ii=.8
2190 GO TO 67
2200 IF mm<=0 THEN GO TO 2210
2202 IF yy<=ab THEN GO TO 65
2209 GO TO 2500
2210 PRINT AT 5,8;"▄▀▀▀▄ ▄▀▀▀▄ █▄ ▄█ █▀
▀▀▀"
2220 PRINT AT 6,8;"█ ▄▄ █▄▄▄█ █▀▀█ █▀
▀▀ "
2230 PRINT AT 7,8;"▀▄▄▄▀ █ █ █ █ █▄
▀▀▀"
2240 PRINT AT 9,8;"▄▀▀▀▄ █ █ █▀▀▀ █▀
▀▀▄"
2250 PRINT AT 10,8;"█ █ █ █ █▀▀▀
█▄▄▀"
2260 PRINT AT 11,8;"▀▄▄▄▀ ▀▄▀ █▄▄▄
█ ▀▄"
2270 FOR a=40 TO 0 STEP -1: BEEP
 a*.002,a: NEXT a: FOR a=30 TO 6
9: BEEP .0015,a: NEXT a: PAUSE 1
00
2280 PAPER 1: BORDER 1: INK 7: B
RIGHT 1: OVER 0: INVERSE 0: CLS
2282 LET w=0
2290 PRINT AT 0,11;"SCOREBOARD"
2292 PRINT AT 3,0;"          SCORE
       NAME"''"  1  ";TAB 14-LE
N STR$ c(1);c(1)," ";c$(1)
2293 PRINT AT 7,0;"  2  ";TAB 14
-LEN STR$ c(2);c(2)," ";c$(2)'"
  3  ";TAB 14-LEN STR$ c(3);c(3)
," ";c$(3)
2294 PLOT 7,154: DRAW 240,0: DRA
W 0,-64: DRAW -240,0: DRAW 0,64:
 PLOT 7,142: DRAW 240,0
2295 PLOT 32,154: DRAW 0,-64: PL
OT 127,154: DRAW 0,-64
2300 PRINT AT 12,6;"YOUR SCORE..
 ";AT 12,18;"........";AT 12,(26
-LEN STR$ ss);ss
2305 IF w>0 THEN GO TO 2370
2310 FOR a=1 TO 3: IF ss>c(a) TH
EN GO TO 2316
2315 NEXT a: GO TO 2370
2316 PRINT AT 16,2;"You have the
 Number ";a;" score."
2317 INPUT "Please ENTER your na
me (up to 14letters)....";c$(4)
2320 FOR w=2 TO a STEP -1
2325 LET c$(w+1)=c$(w)
2330 LET c(w+1)=c(w)
2332 NEXT w
2335 LET w=2
2340 LET c(a)=ss
2350 LET c$(a)=c$(4)
2355 PRINT AT 16,2;"
                   "

2360 GO TO 2285
2370 PRINT AT 18,6;"C=Copy of sc
oreboard"
2380 PRINT AT 16,4;"Please make
a choice...."
2385 PRINT ''"          E=End the Pr
                   "
ogram
2390 PRINT "          S=Start anothe
                   "
r game
2400 LET a$=INKEY$: IF a$="" THE
N GO TO 2400
2409 IF a$="e" OR a$="E" THEN CL
S
2410 IF a$="e" OR a$="E" THEN ST
OP
2420 IF a$="s" OR a$="S" THEN GO
 TO 2422
2421 GO TO 2430
2422 LET xx=5: LET pp=42: INK 0:
 PAPER 5: BORDER 5: BRIGHT 0: OV
ER 0: INVERSE 0: FLASH 0: CLS :
BEEP .5,30
```

```
2423 DIM g(7): LET mm=7: LET vv=
0: LET g(1)=28: LET g(2)=60: LET
 g(3)=92: LET g(4)=128: LET g(5)
=164: LET g(6)=196: LET g(7)=228
2424 LET ab=28: GO TO 6050
2430 IF a$="c" OR a$="C" THEN GO
 TO 2438
2431 GO TO 2370
2438 COPY : BEEP .5,30: PRINT AT
 18,6;"                        ": G
O TO 2380
2500 BORDER 0: PAPER 0: BRIGHT 1
: INK 4: INVERSE 0: FLASH 0: OVE
R 0: CLS
2501 LET y=0: LET n=0
2502 PRINT AT 17,2;"CITY PIONTS.
...............";AT 19,2;"MISS
ILE POINTS.............."
2510 PRINT AT 0,10;"BONUS POINTS
"

2511 FOR a=1 TO mm: IF g(a)=128
THEN GO TO 2513
2512 NEXT a: GO TO 2520
2513 FOR w=a TO mm-1: LET g(w)=g
(w+1): NEXT w. LET mm=mm-1
2520 PRINT AT 3,5;"CITIES REMAIN
ING"
2525 PRINT AT 5,7;"NONE"
2530 FOR a=1 TO mm
2540 PRINT AT 5,4*a-1;"🏙      "
2542 LET y=y+2000: PRINT AT 17;3
0-LEN STR$ y;y: BEEP .025,30
2550 NEXT a
2560 PRINT AT 8,5;"MISSILES REMA
INING"
2562 IF t>=30 THEN PRINT AT 10,7
;"NONE"
2565 LET c=0: LET w=100
2570 FOR a=1 TO (30-t)
2580 PLOT a*15+10-c,w: DRAW -1,-
1: DRAW -1,-2: DRAW 0,-5: DRAW -
2,-2: DRAW 2,-4: DRAW 0,-5: DRAW
 -2,-2: DRAW 0,-3: DRAW 6,-2: DR
AW 0,1
2585 PLOT a*15+10-c,w: DRAW 1,-1
: DRAW 1,-2: DRAW 0,-5: DRAW 2,-
2: DRAW -2,-4: DRAW 0,-5: DRAW 2
,-2: DRAW 0,-3: DRAW -6,-2: DRAW
 0,1
2586 LET n=n+500: PRINT AT 19,30
-LEN STR$ n;n: BEEP .025,35
2588 IF a=15 THEN LET w=70
2589 IF a=15 THEN LET c=225
2590 NEXT a
2600 LET ss=ss+n+y: PRINT AT 21,
2;"NEW SCORE....................
";AT 21,30-LEN STR$ ss;ss
2605 IF vv=2 THEN GO TO 2700
2610 IF ss>=100000 THEN GO TO 26
40
2620 IF ss>=50000 THEN GO TO 264
0
2630 GO TO 2700
2640 IF vv=1 AND ss<100000 THEN
GO TO 2700
2642 LET vv=vv+1: IF mm>=6 THEN
GO TO 2700
2645 LET mm=mm+1
2650 LET g(mm)=ww
2660 PRINT FLASH 1; INK 6;AT 1,9
;"BONUS CITY 🏙"
2700 FOR a=1 TO 50: NEXT a: INPU
T "Press ENTER to Continue....";
a$
2704 IF xx=5 THEN GO TO 2717
2705 IF xx=4 THEN GO TO 2715
2710 LET xx=4: LET pp=34: INK 0:
 PAPER 4: BORDER 4: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2711 GO TO 2720
2715 LET xx=6: LET pp=50: INK 0:
 PAPER 6: BORDER 6: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2716: GO TO 2720
2717 LET xx=5: LET pp=42: INK 0:
 PAPER 5: BORDER 5: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2720 FOR a=1 TO mm: LET tt=(g(a)
+3)/8-2
2730 LET jj=jj+2: LET ab=ab+1: P
RINT AT 21,tt;"🏙": NEXT a
2735 LET mm=mm+1: LET g(mm)=128
2740 PLOT 0,0: DRAW 255,0
2750 GO SUB 6213
2760 GO TO 20
3000 IF ad=1 THEN GO TO 160
3001 LET ad=1: INK 8
3005 LET ac=0
3006 GO TO 132
3010 LET ac=ac+1
3011 PRINT AT 11,ac;"✈ "
3020 IF ATTR (11,ac+2)=pp THEN G
O TO 5000
3025 IF RND>.3 THEN GO TO 3050
3030 IF ac>27 THEN GO TO 3050
3035 LET ae=16+ac*8: LET af=(ac+
2)/4
3040 IF ae>g(af)-6 AND ae<g(af)+
4 THEN GO TO 3100
3050 PRINT AT 11,ac;" ✈"
3055 GO TO 132
3060 IF ac=29 THEN LET ad=0
3070 IF ad=1 THEN GO TO 3010
3075 PRINT AT 11,0;"
                     ";AT y,x;"X"
3080 GO TO 132
3100 IF yy>=ab THEN LET ii=1
3105 LET b=b+1
3110 IF b>10 THEN LET b=b-1
3120 IF b>10 THEN GO TO 3050
3130 LET yy=yy+1
3140 LET f(b)=1
3150 LET d(b)=g(af)-15.4
3160 LET e(b)=75: LET i(b,1)=d(b
): LET i(b,2)=80
3165 PLOT d(b)-1,80: DRAW 1,-5
3170 GO TO 3050
4000 FOR a=0 TO 151
4010 READ b
4020 POKE USR "🏙"+a,b
4030 NEXT a
4035 GO TO 11
4040 DATA 6,6,22,30,95,95,127,25
5,28,28,92,92,125,125,253,255
4050 DATA 0,0,64,96,104,232,250,
255,7,7,15,15,15,15,7,7
4060 DATA 224,224,240,240,240,24
0,224,224,0,0,0,0,0,0,1,3
4070 DATA 0,0,0,0,60,255,255,255
,0,0,0,0,0,0,128,192
4080 DATA 3,1,0,0,0,0,0,0,255,25
5,255,60,0,0,0,0
4090 DATA 192,128,0,0,0,0,0,0,60
,126,255,255,255,255,126,60
4100 DATA 0,0,24,60,60,24,0,0,19
2,244,127,63,127,195,7,14
4110 DATA 192,224,240,252,255,24
0,192,0,60,126,90,126,60,219,60,
195
4120 DATA 12,14,7,3,7,12,0,0,12,
14,255,255,255,63,124,224
4130 DATA 0,0,0,192,240,0,0,0
5000 LET ai=83: LET ah=ac*8+20
5001 PRINT AT 11,0;"
                     ";AT y,x;"X"
5002 LET aj=1
5003 LET ss=ss+3000: PRINT AT 0,
10;"                  "; OVER 1; I
NK 9;AT 0,10;"SCORE ";ss
5004 GO TO 5010
5005 LET ah=d(a): LET ai=e(a)
5010 IF ai-10>174 OR ah-10<0 OR
ah+10>255 THEN GO TO 5013
5011 GO TO 5014
5013 BEEP .025,20: GO TO 5190
5014 LET ak=0
5015 LET ak=ak+1
5016 FOR w=1 TO 5 STEP 2
5020 PLOT ah-w,ai-w: DRAW 1,0
5025 PLOT ah-w*2,ai: DRAW 1,0
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5030 PLOT ah+w,ai-w: DRAW 1,0
5035 PLOT ah+w*2,ai: DRAW 1,0
5040 PLOT ah+w,ai+w: DRAW 1,0
5045 PLOT ah,ai+w*2: DRAW 1,0
5050 PLOT ah-w,ai+w: DRAW 1,0
5055 PLOT ah,ai-w*2: DRAW 1,0
5180 NEXT w
5182 IF ak=1 THEN INVERSE 1:
5183 IF ak=1 THEN BEEP .025,20
5184 IF ak=1 THEN GO TO 5015
5185 INVERSE 0
5190 IF aj=1 THEN LET ad=0
5192 IF aj<>1 THEN GO TO 8002
5195 LET aj=0
5200 GO TO 100
6000 IF t>=30 THEN GO TO 7069
6001 OVER 1
6002 LET o=x*8-112-kk: LET r=170
-y*8-ll
6003 PLOT oo,qq: DRAW o,r
6004 PLOT oo,qq: DRAW o,r
6008 OVER 0
6010 INVERSE 1: PLOT oo-1,qq: DR
AW 2,0: PLOT oo,qq: DRAW 0,5
6015 IF nn=0 THEN LET ll=ll-4
6018 IF nn=0 THEN LET kk=kk+21-l
l*1.5
6020 IF nn=0 THEN LET nn=24-ll*1
.5
6025 LET kk=kk-6
6030 LET nn=nn-6
6040 LET oo=kk+116: LET qq=ll+2
6045 IF t<29 AND ll<0 AND kk=21
THEN GO SUB 6214
6049 INVERSE 0: GO TO 7000
6050 INK 0: PAPER 5: BORDER 5: B
RIGHT 0: OVER 0: INVERSE 0: CLS
: PRINT AT 10,4;"Do you want ins
tructions?": FOR w=1 TO 100: NEX
T w
6051 LET b$=INKEY$: IF b$="" THE
N GO TO 6051
6052 IF b$="y" OR b$="Y" THEN GO
 TO 6054
6053 GO TO 6198
6054 CLS : PRINT AT 0,9;"YOUR BR
IEFING"
6055 PRINT '"You are in charge o
f a Surface- to-Air Guided Missi
le base at   the outbreak of nuc
lear war..."
6056 PRINT '"Your job is to defe
nd 5 cities  and your own missil
e launching  site from the nucle
ar missiles.."
6057 PRINT '"You have THIRTY Sur
face-to-Air  Missiles, up to 10
of these willbe at the launching
 site at any time, if the site i
s hit, all   missiles present, w
ill be       destroyed."
6058 PRINT '"Be Careful, you are
 the last    line of defence, th
e longer you can hold off the at
tack the morepeople can be evacu
ated."
6059 FOR w=1 TO 500: NEXT w: PRI
NT #1;AT 1,2;"PRESS ANY KEY TO C
ONTINUE...": PAUSE 0
6060 CLS : PRINT AT 0,6;"TECHNIC
AL DETAILS"
6061 PRINT '"The Surface-to-Air
Missiles are guided by moving th
e ""X"" to the point that the mi
ssile is to   explode...to dest
roy a Nuclear  Missile or Plane,
 you can move  the ""X"" in 8 di
rections."
6062 PAPER 6: FOR w=9 TO 21: PRI
NT AT w,0;"
              ": NEXT w: PRINT AT 1
2,0;"▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ▀▀
▀"
6063 PRINT INVERSE 1;"1 ■2 ■3 ■4
 ■5 ■6 ■7 ■8 ■9 ■0 "
6064 PRINT INVERSE 1'"■Q ■"; INK
 1;"W ■"; INK 5; PAPER 0;"E "; P
APER 6; INK 0;"■R ■T "; INK 2;"■
Y ■U ■I ■O ■P "
6065 PRINT " ▀▀ "; INK 1;"▀▀ ";
INK 5;"▀▀"; INK 0;" ▀▀ ▀▀ "; INK
 2;"▀▀ ▀▀ ▀▀ ▀▀ ▀▀"
6066 PRINT "  ▀▀ ▀▀ ▀▀ ▀▀ ▀▀ ";
INK 3;"▀▀ ▀▀ ▀▀ ▀▀ ▀▀"
6067 PRINT INVERSE 1;"■A ■S ■D
■F ■G "; INK 3;"■H ■J ■K ■L ■  ■
"
6068 PRINT INVERSE 1'"   ■Z "; I
NK 4;"■X ■C ■V "; INK 0;"■B ■N ■
M ■ ■  ■"
6069 PRINT "▀▀ ▀▀ "; INK 4;"▀▀
▀▀ ▀▀"; INK 0;" ▀▀ ▀▀ ▀▀ ▀▀ ▀▀
"
6070 INK 8: PLOT 0,0: DRAW 255,0
: DRAW 0,104: DRAW -255,0: DRAW
0,-104: PLOT 0,78: DRAW 255,0
6071 PRINT OVER 1;AT 9,0;" KEYBO
ARD DIAGRAM WITH KEY USES."
6072 PRINT INK 1; INVERSE 1;AT 1
1,4;"LEFT■"; INK 5; PAPER 0;"RIG
HT"; PAPER 6;"■"; INK 2;"UP■"; I
NK 3;"DOWN■"; INK 4;"FIRE■"
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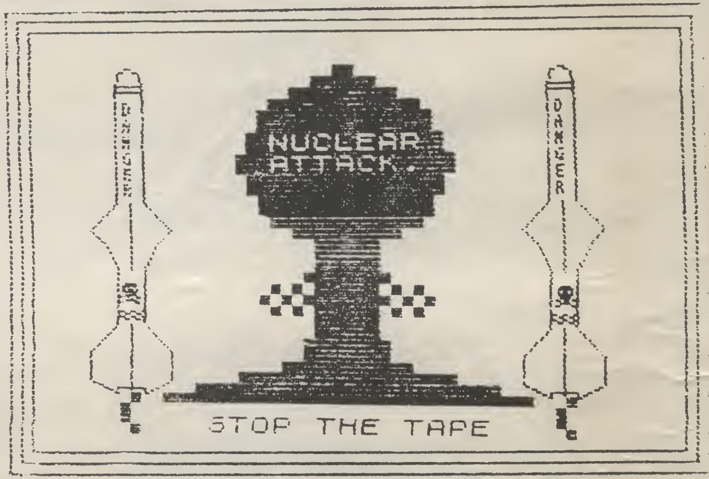

The screen display you will be greeted with when you first RUN the game.

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6073 FOR w=1 TO 500: NEXT w: PRI
NT #1;AT 1,2;"PRESS ANY KEY TO C
ONTINUE...": PAUSE 0
6074 PAPER 5: CLS : PRINT AT 0,1
2;"SCORING"
6075 PRINT '"For each missile sh
ot down you  get 1000 points. F
or each city and each Surface-to
-Air Missile remaining intact at
 the end of  a barage you reciev
e bonus      points, after 50,00
0 & 100,000  you recieve a bonus
 city..."
6076 PRINT '"You can shoot missi
les down     while moving your s
ites in any  of 8 directions. E
xperince willshow you that it is
 best to fireyour missiles into
the path of  your target."
6077 PRINT ''"Good Luck..Your go
ing to need it"
6078: FOR w=1 TO 500: NEXT w: PR
INT ''"  PRESS ANY KEY TO CONTIN
UE...": PAUSE 0: GO TO 6198
6080 PRINT AT 3,14;"■";AT 4,12
;"■■■■■";AT 5,11;"■■■■■■■■
6081 PRINT AT 6,11;"■■■■■■■■";A
T 7,10;"■■■■■■■■■■";AT 8,11;"■■
■■■■■■"
6082 PRINT AT 9,11;"■■■■■■■■";A
T 10,12;"■■■■■■";AT 11,14;"■■"
```
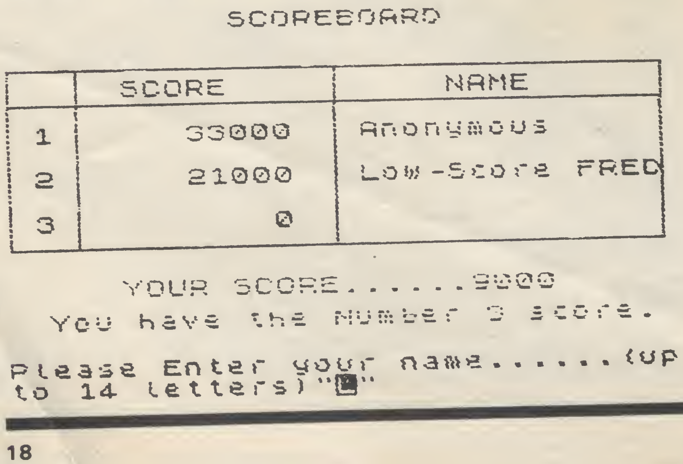

```
2423 DIM g(7): LET mm=7: LET vv=
0: LET g(1)=28: LET g(2)=60: LET
 g(3)=92: LET g(4)=128: LET g(5)
=164: LET g(6)=196: LET g(7)=228
2424 LET ab=28: GO TO 6050
2430 IF a$="c" OR a$="C" THEN GO
 TO 2438
2431 GO TO 2370
2438 COPY : BEEP .5,30: PRINT AT
 18,6;"                       ": G
O TO 2380
2500 BORDER 0: PAPER 0: BRIGHT 1
: INK 4: INVERSE 0: FLASH 0: OVE
R 0: CLS
2501 LET y=0: LET n=0
2502 PRINT AT 17,2;"CITY PIONTS,
.................";AT 19,2;"MISS
ILE POINTS................"
2510 PRINT AT 0,10;"BONUS POINTS
"
2511 FOR a=1 TO mm: IF g(a)=128
THEN GO TO 2513
2512 NEXT a: GO TO 2520
2513 FOR w=a TO mm-1: LET g(w)=g
(w+1): NEXT w. LET mm=mm-1
2520 PRINT AT 3,5;"CITIES REMAIN
ING"
2525 PRINT AT 5,7;"NONE"
2530 FOR a=1 TO mm
2540 PRINT AT 5,4*a-1;"         "
2542 LET y=y+2000: PRINT AT 17;3
0-LEN STR$ y;y: BEEP .025,30
2550 NEXT a
2560 PRINT AT 8,5;"MISSILES REMA
INING"
2562 IF t>=30 THEN PRINT AT 10,7
;"NONE"
2565 LET c=0: LET w=100
2570 FOR a=1 TO (30-t)
2580 PLOT a*15+10-c,w: DRAW -1,-
1: DRAW -1,-2: DRAW 0,-5: DRAW -
2,-2: DRAW 2,-4: DRAW 0,-5: DRAW
 -2,-2: DRAW 0,-3: DRAW 6,-2: DR
AW 0,1
2585 PLOT a*15+10-c,w: DRAW 1,-1
: DRAW 1,-2: DRAW 0,-5: DRAW 2,-
2: DRAW -2,-4: DRAW 0,-5: DRAW 2
,-2: DRAW 0,-3: DRAW -6,-2: DRAW
 0,1
2586 LET n=n+500: PRINT AT 19,30
-LEN STR$ n;n: BEEP .025,35
2588 IF a=15 THEN LET w=70
2589 IF a=15 THEN LET c=225
2590 NEXT a
2600 LET ss=ss+n+y: PRINT AT 21,
2;"NEW SCORE.....................
";AT 21,30-LEN STR$ ss;ss
2605 IF vv=2 THEN GO TO 2700
2610 IF ss>=100000 THEN GO TO 26
40
2620 IF ss>=50000 THEN GO TO 264
0
2630 GO TO 2700
2640 IF vv=1 AND ss<100000 THEN
GO TO 2700
2642 LET vv=vv+1: IF mm>=6 THEN
GO TO 2700
2645 LET mm=mm+1
2650 LET g(mm)=ww
2660 PRINT FLASH 1; INK 6;AT 1,9
;"BONUS CITY "
2700 FOR a=1 TO 50: NEXT a: INPU
T "Press ENTER to Continue....";
a$
2704 IF xx=6 THEN GO TO 2717
2705 IF xx=4 THEN GO TO 2715
2710 LET xx=4: LET pp=34: INK 0:
 PAPER 4: BORDER 4: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2711 GO TO 2720
2715 LET xx=6: LET pp=50: INK 0:
 PAPER 6: BORDER 6: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2716: GO TO 2720
2717 LET xx=5: LET pp=42: IN
 PAPER 5: BORDER 5: OVER 0: INVE
RSE 0: BRIGHT 0: FLASH 0: CLS
2720 FOR a=1 TO mm: LET tt=(g(a)
+3)/8-2
2730 LET jj=jj+2: LET ab=ab+1: P
RINT AT 21,tt;"": NEXT a
2735 LET mm=mm+1: LET g(mm)=128
2740 PLOT 0,0: DRAW 255,0
2750 GO SUB 6213
2760 GO TO 20
3000 IF ad=1 THEN GO TO 160
3001 LET ad=1: INK 8
3005 LET ac=0
3006 GO TO 132
3010 LET ac=ac+1
3011 PRINT AT 11,ac;"  "
3020 IF ATTR (11,ac+2)=pp THEN G
O TO 5000
3025 IF RND>.3 THEN GO TO 3050
3030 IF ac>27 THEN GO TO 3050
3035 LET ae=16+ac*8: LET af=(ac+
2)/4
3040 IF ae>g(af)-6 AND ae<g(af)+
4 THEN GO TO 3100
3050 PRINT AT 11,ac;" "
3055 GO TO 132
3060 IF ac=29 THEN LET ad=0
3070 IF ad=1 THEN GO TO 3010
3075 PRINT AT 11,0;"
                    ";AT y,x;"X"
3080 GO TO 132
3100 IF yy>=ab THEN LET ii=1
3105 LET b=b+1
3110 IF b>10 THEN LET b=b-1
3120 IF b>10 THEN GO TO 3050
3130 LET yy=yy+1
3140 LET f(b)=1
3150 LET d(b)=g(af)-15.4
3160 LET e(b)=75: LET i(b,1)=d(b
): LET i(b,2)=80
3165 PLOT d(b)-1,80: DRAW 1,-5
3170 GO TO 3050
4000 FOR a=0 TO 151
4010 READ b
4020 POKE USR ""+a,b
4030 NEXT a
4035 GO TO 11
4040 DATA 6,6,22,30,95,95,127,25
5,28,28,92,92,125,125,253,255
4050 DATA 0,0,64,96,104,232,250,
255,7,7,15,15,15,15,7,7
4060 DATA 224,224,240,240,240,24
0,224,224.0,0,0,0,0,0,1,3
4070 DATA 0,0,0,0,60,255,255,255
,0,0,0,0,0,0,128,192
4080 DATA 3,1,0,0,0,0,0,0,255,25
5,255,60,0,0,0,0
4090 DATA 192,128,0,0,0,0,0,0,60
,126,255,255,255,255,126,60
4100 DATA 0,0,24,60,60,24,0,0,19
2,244,127,63,127,195,7,14
4110 DATA 192,224,240,252,255,24
0,192,0,60,126,90,126,60,219,60,
195
4120 DATA 12,14,7,3,7,12,0,0,12,
14,255,255,255,63,124,224
4130 DATA 0,0,0,192,240,0,0,0
5000 LET ai=83: LET ah=ac*8+20
5001 PRINT AT 11,0;"
                    ";AT y,x;"Y
5002 LET aj=1
5003 LET ss=ss+3000: PRINT
10;"                ";
NK 9;AT 0,10;"SCORE ":
5004 GO TO 5010     ,q(w);"●"
5005 LET ah=d(a) ),q(w)-1;"   ";
5010 IF ai-10 -1;"  ";AT m(w)+1
ah+10>255 T
5011 GO T
5013 BEEP .01,35
5014 LET ee=ee+(w-ee)
5069 INK 6: OVER 0: GO SUB 100
7070 INK 2: OVER 1
7071 FOR w=ff TO s
7072 PRINT AT m(w),q(w);"●"
```

▶

```
7075 PRINT AT m(w),q(w)-1;"■■";
AT m(w)-1,q(w)-1;"▲";AT m(w)+1
,q(w)-1;"▼"
7080 NEXT w
7081 LET ff=ff+(w-ff)
7082 IF s=30 THEN GO TO 7084
7083 INK 8: OVER 0: GO SUB 100
7084 INK 2: OVER 1
7085 FOR w=gg TO s
7088 PRINT AT m(w),q(w);"●"
7090 PRINT AT m(w),q(w);"•"
7095 NEXT w
7096 LET gg=gg+(w-gg)
7097 IF s=30 THEN GO TO 7099
7098 INK 8: OVER 0: GO SUB 100
7099 INK 0: OVER 0
7100 FOR w=hh TO s
7105 PRINT AT m(w),q(w)-1;"   ";
AT m(w)-1,q(w)-1;"   "
7106 IF m(w)>=20 THEN GO TO 7108
7107 PRINT AT m(w)+1,q(w)-1;"
": GO TO 7110
7109 PRINT OVER 1;AT m(w)+1,q(w)
-1;"   "
7110 NEXT w
7120 LET hh=hh+(w-hh)
7130 PRINT INK 0; OVER 0;AT y,x;
"X"
7135 PRINT AT 0,10;"
  "; OVER 1; INK 9;AT 0,10;"SC
ORE ";ss
7140 LET bb=0
7150 INK 0: INVERSE 0: OVER 0: G
O TO 100
7200 LET dd=1: OVER 0
7210 FOR w=1 TO mm
7220 IF d(a)<g(w)+8 AND d(a)>g(w
)-8 THEN GO TO 7231
7230 NEXT w: GO TO 7996
7235 LET zz=w
7240 LET tt=(d(a)+3)/8-2
7250 PRINT AT 19,tt+1;" ";AT 20,
tt;"   ";AT 21,tt;"
7260 LET uu=g(w)
7268 PLOT 0,0: DRAW 255,0
7270 PLOT uu-4,1: DRAW 7,0: PLOT
 uu-2,2: DRAW 3,0
7275 PLOT uu-5,2: DRAW 9,0: PLOT
 uu-7,1: DRAW 13,0: PLOT uu-2,3:
 DRAW 3,0
7280 PLOT uu-4,3: DRAW 7,0: PLOT
 uu-6,2: DRAW 11,0: PLOT uu-2,4:
 DRAW 3,0: PLOT uu-9,1: DRAW 17,
0: PLOT uu-1,5: PLOT uu,5
7285 PLOT uu-5,4: DRAW 9,0: PLOT
 uu-6,3: DRAW 11,0: PLOT uu-4,5:
 DRAW 7,0: PLOT uu-8,2: DRAW 15,
0: PLOT uu-3,6: DRAW 5,0: PLOT u
u-11,1: DRAW 21,0: PLOT uu-1,7:
PLOT uu,7
7286 OVER 1: INK 8: PAPER 7: BRI
GHT 1: PRINT AT 21,tt-1;"
                              ";
7287 PRINT AT 20,tt-2;"
AT 19,tt-1;"        ";AT 18,tt;"
";AT 17,tt+1;" "
7288 BRIGHT 0: OVER 1: INK 8: PA
PER xx: PRINT AT 21,tt-1;"
                              ";
7290 PRINT AT 20,tt-2;"
AT 19,tt-1;"     ";AT 18,tt;"
";AT 17,tt+1;" "
7292 OVER 0
7294 PLOT uu-7,5: DRAW 13,0: PLO
T uu-7,6: DRAW 13,0: PLOT uu-8,4
: DRAW 15,0: PLOT uu-6,7: DRAW 1
1,0: PLOT uu-8,3: DRAW 15,0
7295 PLOT uu-5,8: DRAW 9,0: PLOT
 uu-9,2: DRAW 17,0: PLOT uu-3,9:
 DRAW 5,0: PLOT uu-13,1: DRAW 25
,0: PLOT uu-1,10: PLOT uu,10
7300 PLOT uu-8,7: DRAW 1,0: PLOT
 uu+6,7: DRAW 1,0: PLOT uu-9,6:
DRAW 1,0: PLOT uu+7,6: DRAW 1,0:
 PLOT uu-8,8: DRAW 2,0: PLOT uu+
5,8: DRAW 2,0
7305 PLOT uu-9,5: DRAW 1,0: PLOT
 uu+7,5: DRAW 1,0: PLOT uu-7,9:
DRAW 13,0: PLOT uu-7,10: DRAW 13
,0: PLOT uu-6,11: DRAW 11,0: PLO
T uu-11,2: DRAW 1,0
7310 PLOT uu+8,2: DRAW 1,0: PLOT
 uu-4,12: DRAW 7,0: PLOT uu-15,1
: DRAW 1,0: PLOT uu+13,1: DRAW 1
,0: PLOT uu-2,13: DRAW 3,0
7315 PLOT uu-10,8: DRAW 1,0: PLO
T uu+8,8: DRAW 1,0: PLOT uu-9,9:
 DRAW 1,0: PLOT uu+7,9: DRAW 1,0
: PLOT uu-10,7: DRAW 1,0: PLOT u
u+8,7: DRAW 1,0: PLOT uu-9,10: D
RAW 1,0: PLOT uu+7,10: DRAW 1,0
7320 PLOT uu-8,11: DRAW 1,0: PLO
T uu+6,11: DRAW 1,0: PLOT uu-8,1
2: DRAW 15,0: PLOT uu-7,13: DRAW
 13,0
7325 PLOT uu-10,3: DRAW 1,0: PLO
T uu+7,3: DRAW 1,0: PLOT uu-5,14
: DRAW 9,0: PLOT uu-14,2: DRAW 2
,0: PLOT uu+10,2: DRAW 2,0
7330 PLOT uu-3,15: DRAW 5,0: PLO
T uu-1,16: PLOT uu,16: PLOT uu-1
7,1: DRAW 1,0: PLOT uu+14,1: DRA
W 1,0
7335 INVERSE 1: PLOT uu-10,3: DR
AW 0,-1: DRAW 1,0: DRAW 0,-2: DR
AW 1,0: DRAW 0,-1: DRAW 2,0: PLO
T uu+9,8. DRAW 0,-1:. DRAW -1,0:
 DRAW 0,-2: DRAW -1,0: DRAW 0,-1
: DRAW -2,0
7340 INVERSE 0: PLOT uu-10,10: D
RAW 0,1: DRAW 1,0: DRAW 0,2: DRA
W 1,0: DRAW 0,1: DRAW 2,0: PLOT
uu+9,10: DRAW 0,1:: DRAW -1,0: D
RAW 0,2: DRAW -1,0: DRAW 0,1: DR
AW -2,0
7345 PLOT uu-8,15: DRAW 15,0: PL
OT uu-7,16: DRAW 13,0: PLOT uu-5
,17: DRAW 9,0: PLOT uu-3,18: DRA
W 5,0: PLOT uu-1,19: PLOT uu,19
7350 INVERSE 1: PLOT uu-10,11: D
RAW 0,-1: DRAW 1,0: DRAW 0,-2: D
RAW 1,0: DRAW 0,-1: DRAW 2,0: PL
OT uu+9,11: DRAW 0,-1:: DRAW -1,
0: DRAW 0,-2: DRAW -1,0: DRAW 0,
-1: DRAW -2,0
7352 PLOT uu-8,6: DRAW 2,0: PLOT
 uu+4,6: DRAW 3,0
7355 INVERSE 0: PLOT uu-10,13: D
RAW 0,1: DRAW 1,0: DRAW 0,2: DRA
W 1,0: DRAW 0,1: DRAW 2,0: PLOT
uu+9,13: DRAW 0,1:: DRAW -1,0: D
RAW 0,2: DRAW -1,0: DRAW 0,1: DR
AW -2,0
7360 PLOT uu-8,18: DRAW 15,0: PL
OT uu-7,19: DRAW 13,0
7365 PLOT uu-5,20: DRAW 9,0: PLO
T uu-3,21: DRAW 5,0: PLOT uu-1,2
2: PLOT uu,22: PLOT uu-6,4: PLOT
 uu+5,4
```

Here we have a screen illustration of the ol' scoreboard...



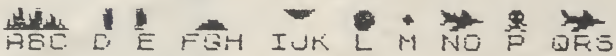
SCOREBOARD

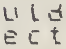
	SCORE	NAME
1	33000	Anonymous
2	21000	Low-Score FRED
3	0	

```
YOUR SCORE......9000
You have the Number 3 score.

Please Enter your name......(up
to 14 letters)"█"
```

```
7370 INVERSE 1: PLOT uu-10,14: D
RAW 0,-1: DRAW 1,0: DRAW 0,-2: D
RAW 1,0: DRAW 0,-1: DRAW 2,0: PL
OT uu+9,14: DRAW 0,-1:: DRAW -1,
0: DRAW 0,-2: DRAW -1,0: DRAW 0,
-1: DRAW -2,0
7375 INVERSE 0: PLOT uu-10,16: D
RAW 0,1: DRAW 1,0: DRAW 0,2: DRA
W 1,0: DRAW 0,1: DRAW 2,0: PLOT
uu+9,16: DRAW 0,1:: DRAW -1,0: D
RAW 0,2: DRAW -1,0: DRAW 0,1: DR
AW -2,0
7380 PLOT uu-8,21: DRAW 15,0: PL
OT uu-7,22: DRAW 13,0
7385 PLOT uu-5,23: DRAW 9,0: PLO
T uu-3,24: DRAW 5,0: PLOT uu-1,2
5: PLOT uu,25: PLOT uu-6,6: DRAW
 0,-1: PLOT uu+5,6: DRAW -1,0
7390 INVERSE 1: PLOT uu-10,17: D
RAW 0,-1: DRAW 1,0: DRAW 0,-2: D
RAW 1,0: DRAW 0,-1: DRAW 2,0: PL
OT uu+9,17: DRAW 0,-1:: DRAW -1,
0: DRAW 0,-2: DRAW -1,0: DRAW 0,
-1: DRAW -2,0
7392 PLOT uu-8,12: DRAW 3,0: PLO
T uu+4,12: DRAW 3,0
7395 INVERSE 0: PLOT uu-10,19: D
RAW 0,1: DRAW 1,0: DRAW 0,2: DRA
W 1,0: DRAW 0,1: DRAW 2,0: PLOT
uu+9,19: DRAW 0,1:: DRAW -1,0: D
RAW 0,2: DRAW -1,0: DRAW 0,1: DR
AW -2,0
7400 PLOT uu-8,24: DRAW 15,0: PL
OT uu-7,25: DRAW 13,0
7402 PLOT uu-8,10: DRAW 3,0: PLO
T uu+4,10: DRAW 4,0
7405 PLOT uu-5,26: DRAW 9,0: PLO
T uu-3,27: DRAW 5,0: PLOT uu-1,2
8: PLOT uu,28: INVERSE 1: PLOT u
u-7,5: DRAW 1,0: DRAW 0,1: PLOT
uu+6,5: DRAW -1,0: DRAW 0,1
7410 PLOT uu-5,7: DRAW 0,-2: PLO
T uu+4,7: DRAW 0,-2
7415 PLOT uu-10,20: DRAW 0,-1: D
RAW 1,0: DRAW 0,-2: DRAW 1,0: DR
AW 0,-1: DRAW 2,0: PLOT uu+9,20:
 DRAW 0,-1:: DRAW -1,0: DRAW 0,-
2: DRAW -1,0: DRAW 0,-1: DRAW -2
,0
7420 INVERSE 0: PLOT uu-10,22: D
RAW 0,1: DRAW 1,0: DRAW 0,2: DRA
W 1,0: DRAW 0,1: DRAW 2,0: PLOT
uu+9,22: DRAW 0,1:: DRAW -1,0: D
RAW 0,2: DRAW -1,0: DRAW 0,1: DR
AW -2,0
7425 PLOT uu-8,27: DRAW 15,0: PL
OT uu-7,28: DRAW 13,0
7430 PLOT uu-5,29: DRAW 9,0: PLO
T uu-3,30: DRAW 5,0: PLOT uu-1,2
8: PLOT uu,31: INVERSE 1: PLOT u
u-8,15: DRAW 4,0: PLOT uu+3,15:
DRAW 4,0: PLOT uu-7,14: DRAW 3,0
: PLOT uu+3,14: DRAW 3,0
7435: PLOT uu+8,10: PLOT uu-4,7:
 DRAW 0,1: DRAW -3,0: DRAW -1,1:
 DRAW 1,1: DRAW 1,-1: DRAW 1,1:
DRAW 1,-1: PLOT uu+3,7: DRAW 0,1
: DRAW 3,0: DRAW 1,1: DRAW -1,1:
 DRAW -1,-1: DRAW -1,1: DRAW -1,
-1: PLOT uu-6,11: DRAW 2,2: PLOT
 uu+5,11: DRAW -2,2
7440 PLOT uu-4,11: PLOT uu+3,11
7450 INVERSE 1: PLOT uu-3,13: DR
AW 0,1: DRAW 1,0: DRAW 1,-1. DRA
W -2,-2: PLOT uu,13: DRAW 1,1: D
RAW 1,0: DRAW -5,-5
7460 PLOT uu-4,6: DRAW 6,6: PLOT
 uu-4,4: DRAW 6,6: PLOT uu-2,4:
DRAW 4,4: PLOT uu,4: DRAW 2,2
7470 PLOT uu+2,4: DRAW 1,1: PLOT
 uu+4,4: DRAW 1,0: PLOT uu-6,4:
PLOT uu-10,3: DRAW 19,0
7480 FOR w=0 TO 3
7490 IF w=1 THEN GO TO 7550
7500 PLOT uu-10,26-w: DRAW 9,9:
DRAW 10,-10: PLOT uu-10,22-w: DR
AW 9,9: DRAW 10,-10: DRAW -4,-4:
 PLOT uu-8,20-w: DRAW 7,7: DRAW
8,-8
7510 PLOT uu-7,17-w: DRAW 6,6: D
RAW 5,-5: PLOT uu-4,16-w: DRAW 3
,3: DRAW 3,-3: PLOT uu-8,22-w: D
RAW 7,-7: DRAW 9,9
7520 PLOT uu-8,26-w: DRAW 7,-7:
DRAW 7,7: PLOT uu-6,28-w: DRAW 5
,-5: DRAW 5,5: PLOT uu-4,30-w: D
RAW 3,-3: DRAW 3,3
7530: NEXT w
7540 INVERSE 0: GO TO 7980
7550 PLOT uu-14,2: DRAW 27,0
7560 PLOT uu-2,13: DRAW 4,0: PLO
T uu-3,8: DRAW 4,0: DRAW 1,-1: D
RAW -4,0: DRAW -1,-1: DRAW 6,0:
DRAW -1,-1: DRAW -6,0: DRAW -1,-
1: DRAW 8,0
7600 PLOT uu-17,1: DRAW 33,0
7610 PLOT uu-6,13: DRAW 1,-1: DR
AW 7,0: DRAW 1,1: PLOT uu-7,11:
DRAW 13,0: DRAW 1,-1: DRAW -15,0
: DRAW 1,-1: DRAW 13,0
7620 GO TO 7500
7985 IF g(zz)=128 THEN LET t=30-
(INT (2.9-t/10))*10
7386 IF g(zz)=128 AND t<30 THEN
LET rr=1
7987 IF g(zz)=128 AND t<30 THEN
GO TO 8002
7989 IF g(zz)<>128 THEN LET ww=g
(w)
7990 FOR w=zz TO mm-1: LET g(w)=
g(w+1): NEXT w: LET mm=mm-1
7996 PLOT 0,0: DRAW 255,0
7999 GO TO 8002
8000 LET ss=ss+1000
8001 GO TO 5005
8002 OVER 0: INVERSE 1: PLOT i(a
,1),i(a,2): DRAW d(a)-i(a,1),e(a
)-i(a,2)
8010 PLOT i(a,1)+(i(a,1)<255),i(
a,2)-(i(a,1)=255): DRAW d(a)-i(a
,1),e(a)-i(a,2)
8020 PLOT i(a,1)-(i(a,1)>0),i(a,
2)-(i(a,1)=0): DRAW d(a)-i(a,1),
e(a)-i(a,2): INVERSE 0
8030 PRINT AT 0,10;"
    "; OVER 1; INK 9;AT 0,10;"SC
ORE ";ss
8035 IF dd=1 THEN PRINT AT y,x;"
X"
8038 LET dd=0
8040 FOR w=a TO b
8045 LET h=w+1
8050 LET e(w)=e(h)
8053 LET d(w)=d(h)
8056 LET f(w)=f(h)
8058 LET i(w,1)=i(h,1)
8059 LET i(w,2)=i(h,2)
8060 NEXT w
8070 LET b=b-1
8080 IF rr=1 THEN GO SUB 6214
8090 LET rr=0
8200 GO TO 100
9000 STOP
9005 CLEAR
9010 SAVE "missile" LINE 10
9999 STOP
```

USR Characters and corresponding letters.......When entering the program, USR symbols should be substituted for the appropriate letter typed in GRAPHICS mode.



Care should be taken to enter the correct "" when typing in the 3000's.

Seriously now . . .

A look at some 'serious' software packages for the ZX Spectrum by Peter Shaw.

The packages reviewed here have no deep connection — their only common theme is 'non-games programs'. I will deal with the character designers and character enhancements first.

Multifont
16/48K Spectrum
Image Systems

This program, as the literature supplied with the cassette says, 'For the first time ever, allows the user an instant choice of six specially designed fonts'. Well, I would hardly call it 'instant' as the code has to be loaded from tape — but the six fonts included are quite well designed.

The six sets include 'Extended Bold', which also has a full lower case set, and can be used as an alternative to the Sinclair set. This, the instructions say, 'demonstrates that true descenders *are* possible on the Sinclair.' The other sets are 'Modern', a square typeface which will match most applications; 'Serif', a classical, formal serif style; 'Lodestone' — similar in style to that used in the Quicksilva's 'Time Gate' — a computer style (although I know of no computer which uses it); and 'Standard Bold'. This last style is one of my favourites (the other is 'Serif') — it is chunky and very neat. It is quite readable and has many applications. The last set, 'Greek', can only really be used for equations, etc. I think this package would have been greatly complimented by including different styles like 'Script' or 'Gothic', but the six provided make for a useful collection.

All six sets can be stored in the computer at the same time and can be called by two POKEs. The demonstration cassette unfortunately didn't work — a CLEAR command had been omitted which made the Spectrum crash (but I'm sure this will be remedied on commercial versions). After a few adjustments I got the program to work, and then converted it easily to the ZX Microdrives. It is very pleasing to program in such an elegant typestyle, but perhaps £4.95 is just a little much for the luxury.

Image Systems, 185 Elm Road, New Malden, Surrey KT 3HX. Tel: 01-942 7138.

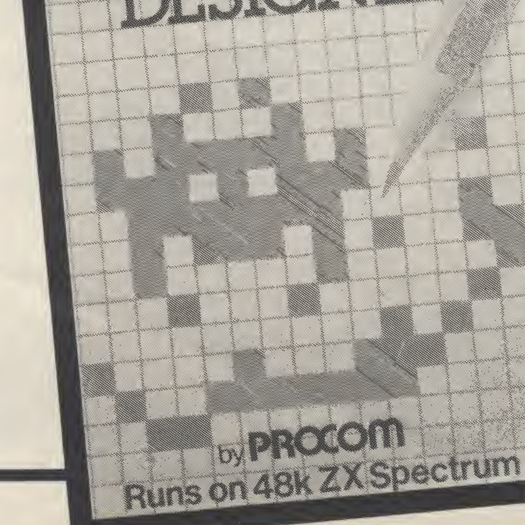
Character Designer
48K Spectrum
Procom

The second character enhancement, which also uses the whole character set, was not without its problems. The software supplied, like Multifont, had some bugs, and some pretty big bugs at that!

The instructions helped me in no great way, and I had very little idea as to what I was supposed to be doing. I soon sussed that the program was an improved version of the character generator you get with the 'Horizons' introduction tape. Improved because it enables you to redefine the whole set, not just the user-defined graphics; when I say 'improved' I don't mean the program itself is better. Apart from the bugs the program is slow and messy — if the programmer had spent a little more time with the program, Procom might have a good product.

Having already written a character generator program myself I find it hard to understand how they make it so slow.

Procom, Museward Ltd., 309 High Road, Loughton, Essex. Tel: 01 508 1216.



kemp
"On a large computer system, a file of this nature would cost between £150-£700"
(Wholesaler's report)
SALES LEDGER
48K SPECTRUM
records amounts
due from customers
up to 1250 entries per month

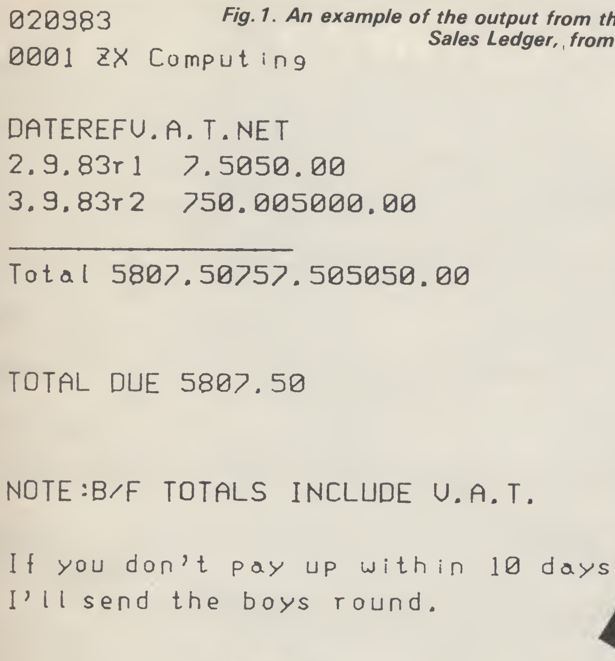
Sales Ledger
48K Spectrum
Kemp Limited

Of all the programs reviewed, this was by far the best presented. All was contained in a smart, video cassette type box, which held the instructions and tape, plus an extra space for your own taped file.

The program itself had a very professional feel, allowing for full manipulation of your accounts. The screen display was green on black (are Kemp trying to emulate the green screen display of the larger machines?) with a blue border.

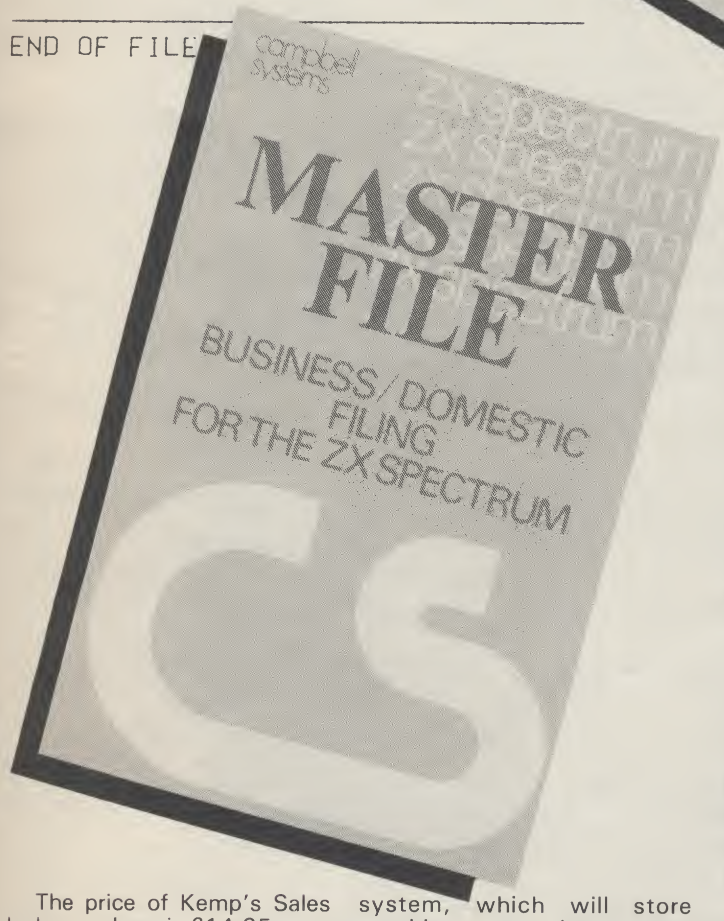
The 'Sales Menu' had all the usual choices, ie Display account, Update account, Correct account, Create, etc, plus full use of a printer; I say 'a' printer and not the ZX Printer because with Sinclair's new RS232 interface you could put an Epson or, as I used, a Tandy or daisywheel. Unfortunately, the way the software printed was a little confusing, all crushed together (see the example printout in Fig. 1).

The file handling was fast, and the program itself was very well written and, as opposed to other instruction booklets, this one was extremely well put together. With a good printer attached to the Spectrum, this program at last makes business software viable on the Sinclair.



```
020983
0001 ZX Computing

DATEREFV.A.T.NET
2.9.83r1  7.5050.00
3.9.83r2  750.005000.00
_____________________
Total 5807.50757.505050.00


TOTAL DUE 5807.50


NOTE:B/F TOTALS INCLUDE V.A.T.

If you don't pay up within 10 days
I'll send the boys round.

__________________________________________
END OF FILE
```

Fig. 1. An example of the output from the program, Sales Ledger, from Kemp Ltd.



The price of Kemp's Sales Ledger package is £14.95.

Kemp Limited, 43 Musewell Hill, London. N10 3PN. Tel: 01-444 5499.

Masterfile
48K Spectrum
Campbell Systems

Masterfile is, as its name suggests, a comprehensive filing system, which will store anything you choose and retrieve in the manner you wish. The example program supplied was a personnel file, which supplied the deepest secrets about BA Campbell's shoe size.

Masterfile lets a user display the files in any way he or she wants; the example program had four different displays, but by the look of things it is possible to have 36 displays, in full colour using high resolution displays. The file itself is very fast, one of the few to be nearly written totally in machine code.

The program is completely menu-driven (which is a great help if you have a memory like mine) and can store 26 items per record with 128 characters per item.

Masterfile is based on the ZX81 program, 'The Fast One', which is used by many '81 owners all over the world. Masterfile's pedigree is sure to make it sell. The price of the package is £15.00.

Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex IG9 6BL.

Bank Account System
48K Spectrum
K.J. Gouldstone

By the way this tape was presented (the user manual is photocopied, with a Sinclair printout on the front and in the insert) I wasn't expecting anything great but, to my surprise, the program is, in fact, pretty good. It will store all bank transactions, standing orders, etc as well as cope with Cash cards, cheques, normal pay, etc. Quite a useful tool really!

Unfortunately, there seems to be something wrong with the tape I received. Either it cannot add up, or the program has a major bug along the line. I labourously entered all my bank transactions since May into the program, updated the file and then asked for a printout of my statement from June 5th. All I got was:

```
BANK STATEMENT 04/09/83
DATE TYP REF VALUE BALANCE
OPENING BALANCE .00
CURRENT A/C BALANCE £0.00
```

Now I know how much I have in my account, and it isn't anything like £0 (or, at least, I hope not). A little more investigation showed me that all my transactions were not yet installed in the main file.

I saved the file just in case I crashed it, then returned to the program. Behold! Somehow half of the transactions were now in the main file. This was still a bit useless unless I wanted to know the state of my account two months ago. At the time of writing this I have still not worked out whether it is me or the program that isn't working correctly, but after a few 'phone calls I shall figure it out!

The price of this package is £5.50.

Mr. K. J. Gouldstone, 45 Burleigh Avenue, Wallington, Surrey SM6 7JG.

JUST AROUND THE CORNER, A NEW

BLACK CRYSTAL

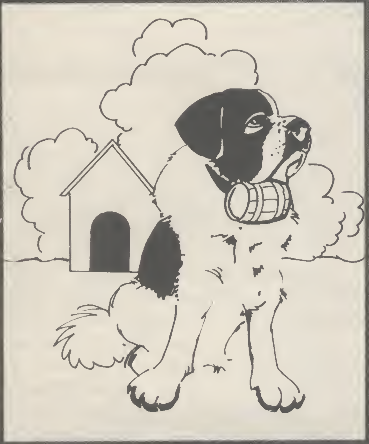
BLACK CRYSTAL

The Classic, six program adventure game for the 48K Spectrum and 16K ZX81 computers. No software collection is complete without it.
Black Crystal is an excellent graphics adventure and a well thought out package. *Sinclair User, April '83*
Black Crystal has impressed me by its sheer quantity and generally high quality of presentation. I am afraid I have become an addict. *Home Computing Weekly, April '83*
Spectrum 48K 180K of program in six parts only **£7.50**
ZX81 16K over 100K of program in seven parts only **£7.50**
WHY PAY MORE FOR LESS OF AN ADVENTURE?

THE CRYPT by Stephen Renton

Prepare yourself for the many challenges that shall confront you when you dare to enter **THE CRYPT**. You will battle with giant scorpions, Hell spawn, Craners, Pos - Negs and if you are unlucky enough — the Dark Cyclops in this arcade style adventure.

Available now for the 48K Spectrum at £4.95



THE ADVENTURES OF ST. BERNARD

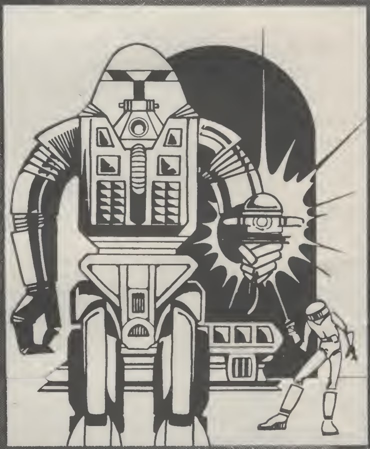
An exciting, fast moving, machine code, arcade game where you guide your intrepid St. Bernard through the perils of the icy wastelands to rescue his Mistress from the clutches of the abominable snowman.

Available for 48K Spectrum £5.75

STARFORCE ONE

Take on the robot guardians of the central computer in a superbly stylised three dimensional battle game.
(100% machine code arcade action)

Available for 48K Spectrum £5.95



ZX COMPENDIUM

ZX81 COMPENDIUM

Alien Intruder, Wumpus Adventure, Numerology, Hangman, Hieroglyphics, Movie Mogul.

The ideal software package for all 16K ZX81 owners. Six major programmes on two cassettes for only **£6.50**
Alien Intruder/Hieroglyphics — Both programs make good use of graphics and words to make a very entertaining package. *Sinclair User Aug 82*
Alien/Hieroglyphics/Wumpus/Movie — A varied mix from Carnell, all featuring imaginative responses and graphics and all of them good games for all ages (Hieroglyphics is particularly good for children). *Popular Computing Weekly Aug 82*

THE DEVIL RIDES IN

I uttered the last incantations as the clock struck thirteen. All fell silent except for a faint rustling in the corner. From out of the shadows they came, all Hell's fury against me but I was not defenseless until the Angel of Death, astride a winged horse, joined the battle. Avoiding his bolts of hell fire, I took careful aim. My chances were slim, but if my luck held.

(Fast moving, machine code, all action, Arcade game)

Available for 48K Spectrum £5.95

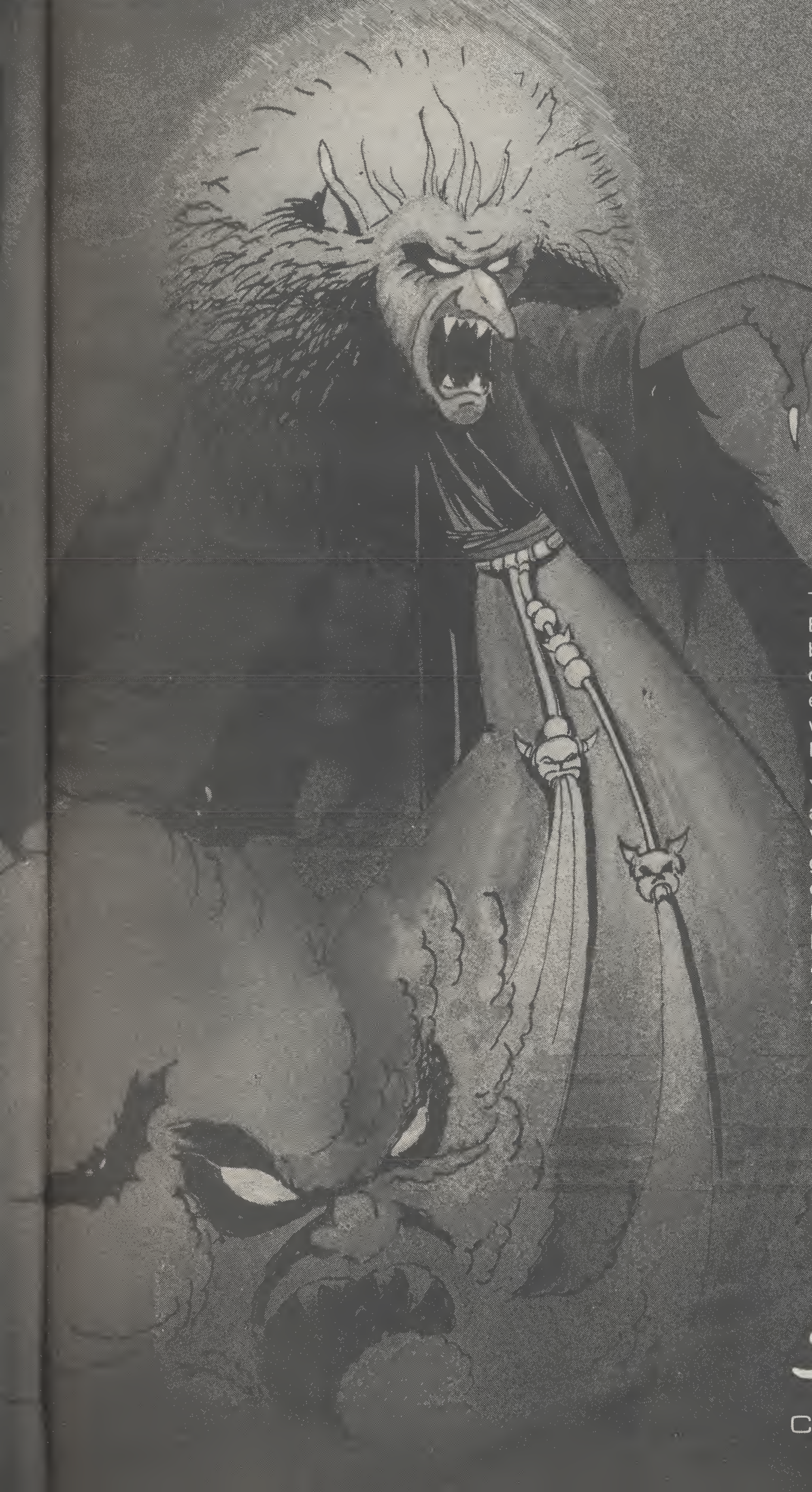
The above are available through most good computer stores or direct from:

CARNELL SOFTWARE LTD.,

North Weylands Ind. Est., Molesey Road, Hersham, Surrey KT12 3PL.

DEALERS: Contact us for your nearest wholesaler.

W RANGE FROM CARNELL SOFTWARE



COMING SOON

"THE WRATH OF MAGRA"

The first born has been destroyed. The Black Crystal of Beroth has been banished. The alliance of Evil has been defeated by the armies of Lord Fendal. So ends the Third Age. Now we invite you to write your name in the history of the Fourth Age of the Third Continent.

You will meet friends and enemies, old and new, in the long awaited sequel to Volcanic Dungeon. Using high resolution graphics and combining the best qualities of "Black Crystal" and "Volcanic Dungeon", we will allow you to become part of this tale of revenge.

"The Wrath of Magra" comes as three, 48K programmes on cassette, boxed with instruction manual and book detailing the history of the Third Continent and the many spells you will be using throughout the game.

NOTE: "The Wrath of Magra" is a complete adventure. You need not buy "Volcanic Dungeon" or "Black Crystal" to play it.

CARNELL SOFTWARE LTD

Club corner

ZX User Group

Dear ZX Computing,
Within the activities of the International Scientific Research, 'Verein Zur Förderung Wissenschaftlicher Forschung e. V.' a computer club is being supported, which specilises in Sinclair computers.

This Sinclair User Club publishes a monthly magazine, the ZX USER, which contains information about ZX hard and software, presents programs and circuits, and offers the club members the possibility of advertisements free of charge.

For club members we are also offering package orders, which reduces the cost of ZX products.

We established a telephone 'hot line' for technical problems — telephone: Austria, 0222/44-32-050.

The ZX User Club holds monthly meetings in Vienna, every first Friday of the month. (Please call for information regarding location and time.)
Yours faithfully,

Thomas Christian,
c/o Wissenschaft Forscht e.V.,
Postfach 141,
A-1190 Vienna, Austria.

ZX Micro Club

Dear ZX Computing,
We are very proud to announce to you the creation of our microcomputer club called ZX-Micro Club. It will be open to all Belgian Spectrum owners.

Our members will enjoy many profits such as a monthly contact bulletin, initiation courses to BASIC programming and weekly meetings are also planned.

We presently have three Spectrums (48K), three TV monitors, an Alphacom 32 printer and a range of hardware, as well as about hundred cassettes of various computers programs.

Should any of your readers wish to find out more information about our club, please contact me at the address given below.
Yours faithfully,

Michael Hunin,
6 Boulevard Leopold III,
Bte 15,
B 1030 Brussels,
Belgium.

Doncaster And District Sinclair User Group

Dear ZX Computing,
May we introduce ourselves to your readers as a newly formed user group for Doncaster and surrounding district.

New members will be welcomed at our Wednesday meetings (note that there is no meeting on the first Wednesday of each month). The meetings are held between 7 and 9 pm in the St Andrews Hall, Morley Road, Wheatley, Doncaster.

Our present membership includes a good cross-section of users of various ages and programming ability. Therefore no-one, be they male, female, child or pensioner, novice or expert, should feel out of place.

You can either contact myself at the address given at the bottom of this letter, or contact the Software Secretary, Tony Cooper, on Doncaster 853124 or the Honarary Secretary, Russell Ward, on Roth 812334.
Yours faithfully,

John Woods (Chairman),
60 Dundas Road,
Wheatley,
Doncaster.
Tel: Doncaster 29357.

Birmingham

Dear ZX Computing,
I own a 48K ZX Spectrum and would like to join a user group in my area. Please could you ask anyone who is already a member of a club in my area to contact me at the address given below. Thank you.
Yours faithfully,

Nathan Carnie,
27 elmfield Crescent,
Moseley,
Birmingham B13 9TL.

NSW Spectrum Users Group

Dear ZX Computing,
I am endeavouring to set up a Spectrum computer club in the Sydney region of Australia, and I was wondering if you would please publish this letter in Club corner, so that your Australian readers may see it.

The club meets once a month, and exchanges ideas, programs, demonstrates new software and hardware, etc.

At the moment there are not very many members of the club, but we do hope to have many more. We also occasionally publish a small newsletter, with the latest Australian computer news, software reviews and programs.

If there is anybody interested in joining our club, could they please ring me on:

(02) 477 4299

. . . or write to us at the address below.
Yours faithfully,

Brendan Walker,
N.S.W. Spectrum Users Group,
88 Old Berowra Road,
Nornsby, N.S.W.,
2077,
Australia.

Beaconsfield and District Computer Club

Dear ZX Computing,
I have just formed the Beaconsfield and District Computer Club, the first meeting having just taken place on September 29th.

I had over 150 enquiries originally, the result of the co-operation of the local library and small shops. Fifty of the enquirers filled in the questionairre I had prepared and from these I am happy to report that 30 have decided to join the club.

ZX Spectrums dominate, but BBC Micros come a close second with VIC 20s following. The main age group of the club is between 14 and 17, although we do have a number of interested adults who come along to meetings. The majority of members are interested in learning to program effectively, so this will be one of our priorities when we begin to structure the club's operation.

Although we have had three appearances in our local paper, I would be very grateful if you could give us some extra publicity. If any of your readers would like to find out more about our club, could they please send an SAE to me at the address below.
Yours faithfully,

James Wilen,
2 Wilton Road,
Beaconsfield,
Bucks HP9 2BS.

If you run, or are a member of, a user club which caters for the Sinclair user, why not get your group on the map by writing to us at:

Club Corner,
ZX Computing,
145 Charing Cross Road,
London WC2H 0EE.

All you have to do is to send us a letter of your club's activities (times of meetings, addresses of who to contact, etc) and we'll do the rest. If you publish a newsletter or club magazine, we'd very much like to see that too.

And if you don't see a club in your area, why not start one up by writing to *ZX Computing* and seeing if any like-minded enthusiasts wish to join you.

ABERSOFT

The Wizard's Warriors

THE WIZARD'S WARRIORS. A fast moving game that matches developments in your skill as a player by becoming increasingly more devious. By offering to you the full range of options you can choose how to control your warrior through the maze. A full implementation of this program enables such features as a continuous series of sound effects, arcade quality graphics, double-point scoring, and--for the very artful --bonus lives.	Spectrum £4.95
FORTH. A full implementation. Ideal for writing fast moving arcade type games. Allows the full colour and sound facilities of the Spectrum to be used. Future Microdrive enhancements will be made available.	Spectrum 14.95
ADVENTURE ONE: Features a save game routine as the game can take months to complete. 'a remarkably good version....well worth the money.' ...*Sinclair User*...	ZX81 £5.95
MAZEMAN: A fast action m/c game that reproduces the spirit of the original. '..is very accurate and fast.' ...*Which Micro?*...	Spectrum £4.95 ZX81 £4.45
CHESS 1.4: Ten levels of play with this m/c program. Good graphic screen display. 'In a class of it's own.' ...*Your Computer*...	ZX81 £5.95
INVADERS: Very fast m/c action. Includes mystery ship and increasingly difficult screens.	ZX81 £4.45

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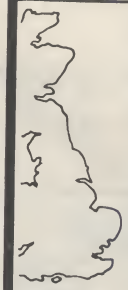
Access

sinclair
Spectrum

KUMA SOFTWARE KUMA SOFTWARE KUMA SOFTWARE



MAP OF UK
A large scale 75 x 60 mile scrolling map is now available on the 48K spectrum. It is easy to use and extremely fast. The program also includes a game using a drifting hot air balloon. Educational and entertaining.
£11.95 including VAT

ZEN EDITOR/ASSEMBLER
Zen enables you to write, assemble, edit and run programs in Z80 Assembly language. These operate faster and take up considerably less memory space than Basic programs. A must for the serious beginner.
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THE CRYPT
Can you collect the four keys of chaos and defeat the Demon Lord? The Crypt is an exciting venture on the 48K spectrum. **£8.00 including VAT**

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SPECTRUM EDITOR/ASSEMBLER A powerful and essential machine code programming aid. 16K and 48K on same cassette + full documentation. Major features: EDITOR with Auto line number and renumber, 40 column screen display, tabulated into fields for easy reading; 5 character label names, easy line editing and cursor control; SAVE/LOAD/VERIFY routines, output to ZX PRINTER. TWO PASS ASSEMBLER accepts all Z80 mnemonics; decimal or hex numbers, simple arithmetic on operands; Assembler Directives — ORG, END, DEFB, DEFW, DEFS, DEFL, EQU, DEFM. **ONLY £8.50**

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S.A.E. for full details.
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*All prices include VAT & P&P.

PICTURESQUE

Spectrum Software available from: Buffer Micro Streatham, Microware Leicester. Educational suppliers: Griffin & George.

Smaug's lair

Can you destroy the dragon's lair in this program written for us by Norman Brooks of Kent.

You are the Gunner Captain on a mission to destroy the dragon's castle.

You have five cannon and 12 cannonballs at your disposal . . . but . . . beware . . . the sound of your guns will wake the dragon. When he flies, time stands still and although he has poor eyesight, he will breathe fire and try to destroy all of your weapons. If he does . . . *run for your life!!!*

To dislodge the most bricks, hit the castle as high as you can by carefully choosing how much gunpowder to use and what angle to set the cannon at. If 6,000 bricks fall then the castle is in ruins and Smaug must seek a new wormhole. Good luck!!!

Cannon and ball

When you first RUN this program you are asked if you require instructions in the usual way. If you reply 'yes' (Y), you are given a brief introduction to the program to get the adrenalin up.

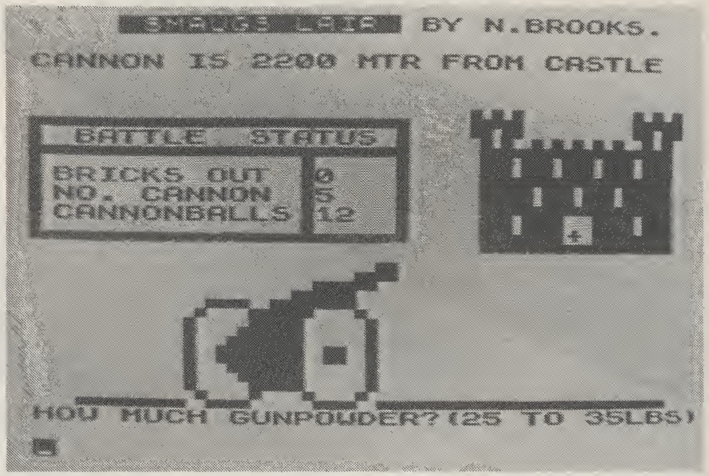
Then, the 'Battle Status' screen is shown and is returned to throughout the game. You are shown the current scores, and the castle will be demolished in proportion to the number of bricks you have knocked out. At the top of the screen, you see how far the computer has set the cannon from the castle ready for your first shot (this is random between 500 and 2,300 metres). You are then invited to enter the size of the gunpowder charge (25 to 35lbs) and what angle of elevation you wish the cannon to be set to (0 to 89 degrees).

The more gunpowder you use, the faster the cannonball leaves the cannon and hence the further the cannonball will fly. Similarly, the angle of elevation affects the range. (I have used Newton's formulae for the motion of projectiles from my old 'A' level maths notes for this part of the program and have consulted books on cannons for details of range and charge to make the scientific aspects of the program as accurate as possible).

A graphical display of the cannon being adjusted to the angle chosen is shown next. (I make no apology for the slowness of this part of the program as I wanted to introduce the concept of 'angles' to my young family. Adding lines 2205 FAST and 2910 SLOW will alleviate any boredom.)

Into battle

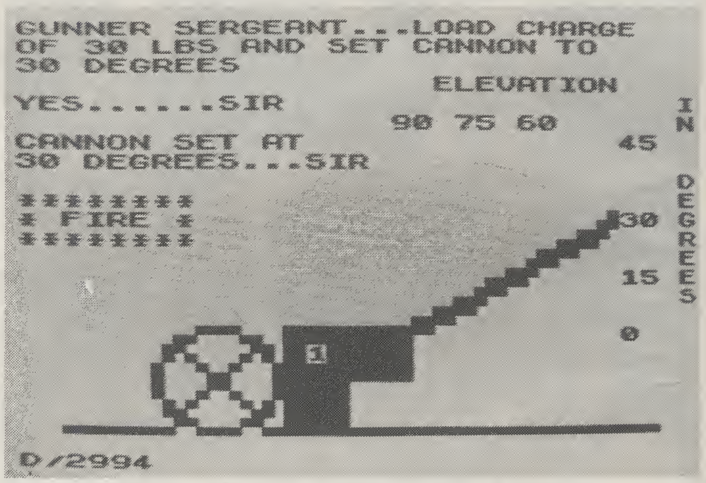
The main action comes on the 'Battlefield' screen which follows on from the previous screen automatically. The cannon is displayed at the computer-selected distance from the castle and the cannonball is fired. Every fifth plot of the cannonball, the dragon flies from the castle. Unbeknown to the player, it has chosen at random whether to attack the cannon or the cannonball. If the dragon chooses the cannon there is a 50% chance of a hit. If the cannonball is selected, then the odds of a hit are only 20%.



```
SMAUGS LAIR BY N.BROOKS.
CANNON IS 2200 MTR FROM CASTLE

BATTLE  STATUS
BRICKS OUT    0
NO. CANNON    5
CANNONBALLS   12

HOW MUCH GUNPOWDER?(25 TO 35LBS)
```

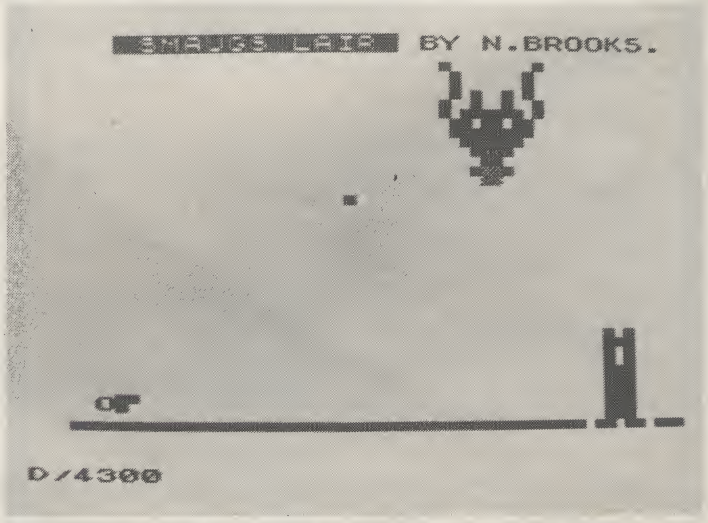
The battle status screen at the start of play.

Should the cannonball reach its target (the castle is 400 metres high) then the Y coordinate of the cannonball plot determines how many bricks are knocked out. (See program lines 1071 to 1079.) When in flight, the dragon may obscure the ball but it will always re-appear in the same position after the dragon has passed — unless, of course, it burns the cannonball to a cinder! You are finally asked if you wish to continue the game. Answering 'no' (N), puts you in retreat and the



```
GUNNER SERGEANT...LOAD CHARGE
OF 30 LBS AND SET CANNON TO
30 DEGREES
                      ELEVATION
YES......SIR                        I
                   90 75 60         N
CANNON SET AT                   45
30 DEGREES...SIR
                                    D
********                            E
* FIRE *                        30  G
********                            R
                                    E
                                15  E
                                    S
                                0



D/2994
```

The display showing the cannon set to a chosen angle.



```
SMAUGS LAIR BY N.BROOKS.






D/4300
```

The battlefield display with the cannonball fired and the dragon in flight.

dragon wins.

At the end of the game (either with 6,000 bricks out of the castle or no cannon/cannonballs left) there is an appropriate 'picture show' to watch which I leave you to discover.

The odds slightly favour the Gunner Captain once an appreciation of charge and angle has been gained. Bear in mind that an angle of 45 degrees will send the ball the maximum distance for any choice of charge (set at which, the castle is seldom damaged incidentally) and an angle of say 60 degrees will result in the same final range as that of 30 degrees, ie each 15 degrees either side of 45 degrees. However, the castle presents a smaller target when dropped on from above rather than hit broadside on, so for a more difficult game try always chosing angles over 45 degrees. I have yet to win doing this!

Variables on a theme

Listed here are the main variables used throughout the game:

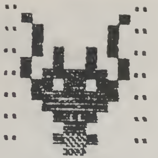
BRIC	The number of bricks knocked out of the castle (6,000 bricks knocked out will win the game for you).
BALL	The number of cannonballs remaining (zero cannonballs left will result in you losing the game).
GUNS	The number of cannon you have remaining (zero cannon left will result in you losing the game).
ROUT	The 'I give up' code.
M	The distance between the cannon and the castle.
N	The random number used to generate the variable, M.
G	If G is equal to one, the dragon attacks the cannonball only.
X and Y	The co-ordinates of the cannonball.
A	The input for the angle of the cannon in radians.
B	The angle converted into radians.
U	The input for the amount (in lbs) of gunpowder used.

Other variables are used but they only exist to aid the running of the program.

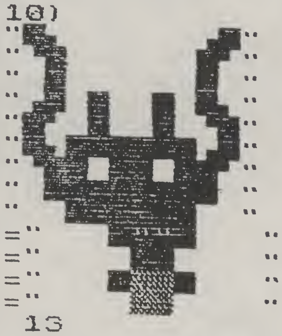
```
  10 REM "SMAUGS LAIR"
  12 PRINT TAB 4;"SMAUGS LAIR 
BY N.BROOKS."
  14 PRINT
  16 PRINT "DO YOU WANT INSTRUCT
IONS? (Y/N)"
  18 IF INKEY$="" THEN GOTO 18
  20 LET E$=INKEY$
  22 IF E$="Y" THEN GOSUB 9000
  50 LET BRIC=0
  60 LET GUNS=5
  70 LET BALL=12
  75 LET ROUT=0
  80 CLS
  90 RAND
 150 LET N=INT (RND*19)
 200 LET M=N*100+500
 210 LET G=0
 225 GOSUB 8000
 340 INPUT A
 350 IF A>69 THEN GOTO 8950
 400 GOSUB 2000
 440 REM **MAIN PROGRAM**
 450 CLS
 480 PRINT TAB 4;"SMAUGS LAIR 
BY N.BROOKS."
 500 LET B=A*PI/180
 650 PRINT AT 15,27;"▙▟"
 660 PRINT AT 16,27;"█▌"
 665 PRINT AT 17,27;"▌▐"
 670 PRINT AT 18,27;"██"
 680 PRINT AT 19,27;"██"
 690 PRINT AT 20,2;"▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄
▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▟▙▄▄"
 700 PRINT AT 19,20-N;"O▛"
 710 GOSUB 6000
 720 LET X1=0
 730 LET Y1=0
 750 FOR X=100 TO M+400 STEP 100
 850 LET Y=(X*TAN B)-(X**2/(U*20
0*COS B*COS B))
 860 IF Y<=0 AND X<M THEN GOTO 1
100
 865 IF Y<=0 AND X>=M+150 THEN G
OTO 1050
 870 PLOT (X/50)+43-2*N,(Y/50)+5
 890 IF X1>0 THEN UNPLOT (X1/50)
+43-(2*N),(Y1/50)+5
 910 IF X/250=INT (X/250) AND X<
>0 THEN GOSUB 3000
 920 LET X1=X
 930 LET Y1=Y
1000 IF X>=M AND X<(M+150) AND Y
<400 THEN GOTO 1070
1020 NEXT X
1050 PRINT AT 12,5;"*CANNONBALL
OVERSHOT*"
1060 GOTO 1120
1070 PRINT AT 16,25;"**HIT**";AT
 15,25;"*******";AT 17,25;"*****
**"
1071 IF Y<=400 AND Y>350 THEN LE
T BRIC=BRIC+1500
1072 IF Y<=350 AND Y>300 THEN LE
T BRIC=BRIC+1000
1074 IF Y<=300 AND Y>200 THEN LE
T BRIC=BRIC+750
1076 IF Y<=200 AND Y>100 THEN LE
T BRIC=BRIC+500
1078 IF Y<=100 THEN LET BRIC=BRI
C+250
1079 PRINT AT 12,2;"*BALL STRUCK
 ";INT (Y);" METRES UP*"
1080 GOTO 1120
1100 PRINT AT 12,6;"*CANNONBALL
SHORT*"
1120 LET BALL=BALL-1
1125 PRINT AT 21,0;"DO YOU WANT
TO CONTINUE?(""N""=NO)"
1127 IF INKEY$="" THEN GOTO 1127
1135 IF INKEY$="N" THEN LET ROUT
=1

1145 GOTO 80
2000 REM **ADJUST CANNON**
2020 CLS
2050 PRINT "GUNNER SERGEANT...LO
AD CHARGE    OF ";U;" LBS AND SET
 CANNON TO       ";A;" DEGREES"
2070 GOSUB 2992
2080 PRINT
2100 PRINT "YES......SIR"
2150 PRINT AT 16,6;" ▗▛▜▖ ██████
██████████"
2160 PRINT AT 17,6;"▛▖ ▗▜██████
"

2165 PRINT AT 17,13;6-GUNS
2170 PRINT AT 18,6;"▌ ▚▞ ██████
"

2180 PRINT AT 19,6;"▌▗▛▜▖▐████"
2190 PRINT AT 20,6;"▙▟  ▙▟▐████"
2200 PRINT AT 21,2;"▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄
▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄"
2202 GOSUB 2992
2210 GOSUB 5000
2220 IF A>45 THEN GOTO 2650
2270 FOR X=1 TO 20
2280 LET Y=X*TAN (A/180*PI)
2320 UNPLOT (X+35),11
2330 UNPLOT (X+35),10
2350 PLOT (X+35),(Y+11)
2360 PLOT (X+35),(Y+10)
2550 NEXT X
2500 GOTO 2910
2650 LET A=90-A
2700 FOR Y=1 TO 20
2720 LET X=Y*TAN (A/180*PI)
2740 UNPLOT (Y+35),11
2760 UNPLOT (Y+35),10
```

▶

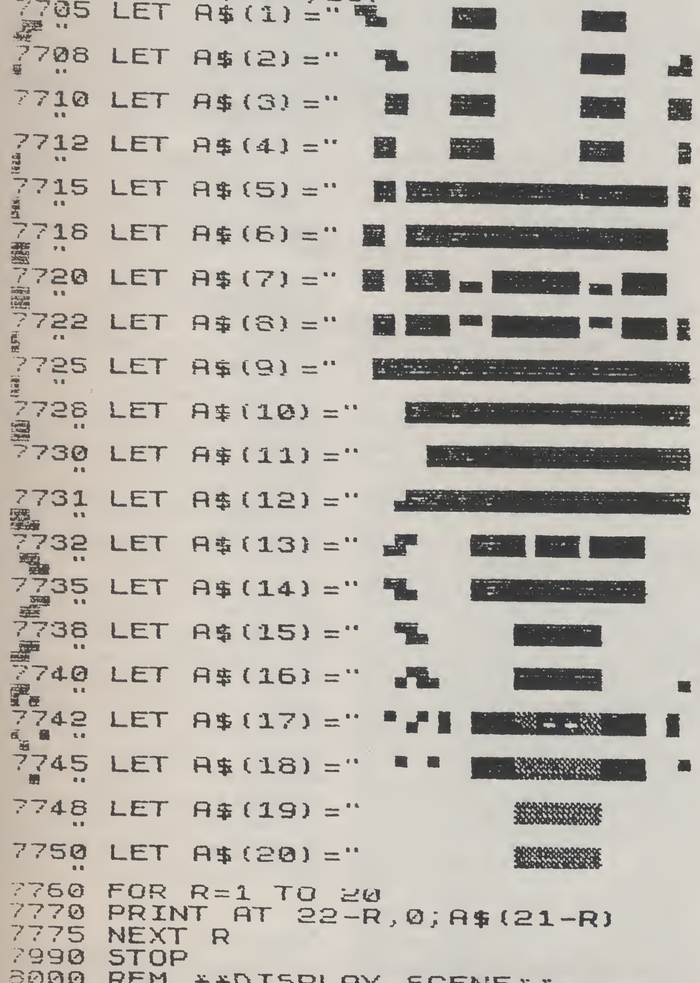
```
2780 PLOT X+35,Y+11
2800 PLOT X+36,Y+11
2850 NEXT Y
2900 LET A=90-A
2920 GOSUB 2992
2930 PRINT AT 6,0;"CANNON SET AT
 "
2940 PRINT A;" DEGREES...SIR"
2945 PRINT
2950 GOSUB 2992
2965 PRINT "********"
2970 PRINT "* FIRE *"
2975 PRINT "********"
2980 GOSUB 2992
2990 RETURN
2992 FOR R=1 TO 25
2994 NEXT R
2996 RETURN
3000 REM **FLY DRAGON**
3020 LET O=INT (RND*2)
3030 IF G=1 THEN LET O=1
3050 IF O=0 THEN LET P=N+4+INT (
RND*4)
3060 IF O=1 THEN LET P=25-INT ((
(X/50)+43-(2*N))/2)+INT (RND*5)
3070 IF P<0 THEN LET P=INT (RND*
5)
3080 IF P>24 THEN LET P=24-INT (
RND*4)
3100 FOR R=1 TO 5
3110 PRINT AT 15-R,26;"▀▜▀ "
3120 PRINT AT 15-R,26;"   "
3130 PLOT (X/50)+43-2*N,(Y/50)+5
3140 NEXT R
3150 FOR R=1 TO 4
3160 PRINT AT 10-R,26;"█"
3170 PRINT AT 9-R,25;"▜ ▛"
3180 PRINT AT 10-R,26;" "
3190 PRINT AT 9-R,25;"   "
3200 PLOT (X/50)+43-2*N,(Y/50)+5
3500 NEXT R
4000 FOR Q=26 TO 26-P STEP -1
4020 PRINT AT 7,Q-1;" ▒▀ "
4030 PRINT AT 7,Q+2;" "
4040 PRINT AT 6,Q-1;" ▀█▀ "
4060 PRINT AT 6,Q+2;" "
4070 PRINT AT 5,Q-2;" ▀███▀ "
4080 PRINT AT 5,Q+3;" "
4090 PRINT AT 4,Q-2;"▚▛▀▜▞"
4120 PRINT AT 4,Q+3;" "
4140 PRINT AT 3,Q-2;"▗▘▌ ▌▚"
4160 PRINT AT 3,Q+3;" "
4180 PRINT AT 2,Q-2;" ▌  ▌"
4200 PRINT AT 2,Q+3;" "
4240 PRINT AT 1,Q-2;"▖   ▖"
4250 PRINT AT 1,Q+3;" "
4260 PLOT (X/50)+43-2*N,(Y/50)+5
4300 NEXT Q
4350 FOR R=7 TO 19
4400 PRINT AT R,Q+1;"▒"
4450 PRINT AT R,Q+1;" "
4460 NEXT R
4500 IF G=0 AND (Q+1=21-N OR Q+1
=20-N) THEN GOSUB 6600
4600 IF Q+1=INT (((X/50)+43-(2*N
))/2) THEN GOTO 6700
4750 FOR R=1 TO 7
4800 PRINT AT R,Q-1;"        "
4810 PLOT (X/50)+43-2*N,(Y/50)+5
4820 NEXT R
4990 RETURN
5000 REM **ANGLE OF TRAGECTORY**
5050 FOR R=0 TO 2
5100 PRINT AT 16-R*3,28;R*15
5200 NEXT R
5250 PRINT AT 6,26;45
5300 FOR R=0 TO 2
5350 PRINT AT 5,16+(7-R*3);60+R*
15
5400 NEXT R
5420 PRINT AT 3,19;"ELEVATION"
5440 LET R$="IN  DEGREES"
5460 FOR R=1 TO 11
5470 PRINT AT 3+R,31;R$(R)
5480 NEXT R
5500 RETURN
6000 REM **FIRE**
6050 LET A$=" BOOM"
6060 LET B$=" "
6100 FOR R=1 TO 5
6150 PRINT AT 19,21-N+R;A$(R)
6200 NEXT R
6250 FOR R=1 TO 5
6300 PRINT AT 19,21-N+R;B$
6350 NEXT R
6500 RETURN
6600 REM *CANNON DESTROYED*
6610 LET GUNS=GUNS-1
6620 PRINT AT 21,0;"*SMAUG HAS D
ESTROYED THE CANNON*"
6630 LET G=1
6650 RETURN
6700 LET BALL=BALL-1
6710 PRINT AT 12,0;"*SMAUG HAS B
URNT THE CANNONBALL*"
6720 GOTO 1125
7000 REM *WIN/LOSE ROUTINES*
7100 PRINT AT 14,19;"CAPTAIN WIN
S"
7110 PRINT AT 15,19;"THE CASTLE
IS"
7120 PRINT AT 16,19;"DESTROYED A
ND"
7130 PRINT AT 17,20;"SMAUG MUST"
7140 PRINT AT 18,20;"SEEK A NEW"
7150 PRINT AT 19,21;"WORMHOLE."
7200 FOR R=11 TO 2 STEP -1
7210 PRINT AT R,24;" ▀▜▀"
7220 PRINT AT R,24;"   "
7230 NEXT R
7240 FOR R=24 TO 2 STEP -1
7250 PRINT AT 2,R;" ▀▜▀"
7260 PRINT AT 2,R;"   "
7270 NEXT R
7280 FOR R=3 TO 31
7290 IF R<=16 THEN PRINT AT 2,R;
"*"
7295 IF R>16 THEN PRINT AT 2,R;"
."
7300 PRINT AT 2,R;"  "
7305 NEXT R
7340 STOP
7350 PRINT AT 13,20;"SMAUG WINS"
7370 IF GUNS=0 THEN GOTO 7410
7380 IF ROUT=1 THEN GOTO 7400
7390 PRINT AT 14,18;"YOU ARE OUT
 OF"
7395 PRINT AT 15,19;"CANNONBALLS
."
7398 GOTO 7440
7400 PRINT AT 14,18;"YOU ARE BEA
TEN"
7405 PRINT AT 15,18;"AND IN RETR
EAT"
7408 GOTO 7440
7410 PRINT AT 14,18;"ALL THE CAN
NON"
7420 PRINT AT 15,18;"ARE DESTROY
ED."
7440 PRINT AT 17,18;"***********
***"
7450 PRINT AT 18,18;"*  FLEE FOR
 *"
7460 PRINT AT 19,18;"* YOUR LIVE
S *"
7470 PRINT AT 20,18;"***********
***"
7472 PRINT AT 11,24;" ▀▜▀"
7473 PRINT AT 11,24;"   "
7474 FOR R=24 TO 17 STEP -1
7475 PRINT AT 12,R;" ▀▜▀"
7476 PRINT AT 12,R;"   "
7477 NEXT R
7478 PRINT AT 11,24;"█"
7479 PRINT AT 12,21;"▐█▄▄▄▄▄▄"
7480 FOR R=1 TO 8
7482 PRINT AT 12+R,17-2*R;" ▀▜▀"
7484 PRINT AT 12+R,17-2*R;"   "
7486 NEXT R
7487 DIM R$(7,5)
```



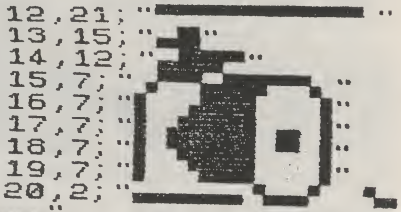
```
7488 LET R$(1)="            "
7489 LET R$(2)="            "
7490 LET R$(3)="            "
7491 LET R$(4)="            "
7492 LET R$(5)="            "
7493 LET R$(6)="            "
7494 LET R$(7)="            "
7495 FOR R=1 TO 7
7496 PRINT AT 21-R,1;R$(8-R)
7497 NEXT R
7500 DIM D$(13,10)
```



```
7510 LET D$(1)="          "
7515 LET D$(2)="          "
7520 LET D$(3)="          "
7525 LET D$(4)="          "
7530 LET D$(5)="          "
7535 LET D$(6)="          "
7540 LET D$(7)="          "
7545 LET D$(8)="          "
7548 LET D$(9)="          "
7550 LET D$(10)="          "
7560 LET D$(11)="          "
7570 LET D$(12)="          "
7580 LET D$(13)="          "
7650 FOR R=1 TO 13
7660 PRINT AT 21-R,1;D$(14-R)
7670 NEXT R
7700 DIM A$(20,18)
```



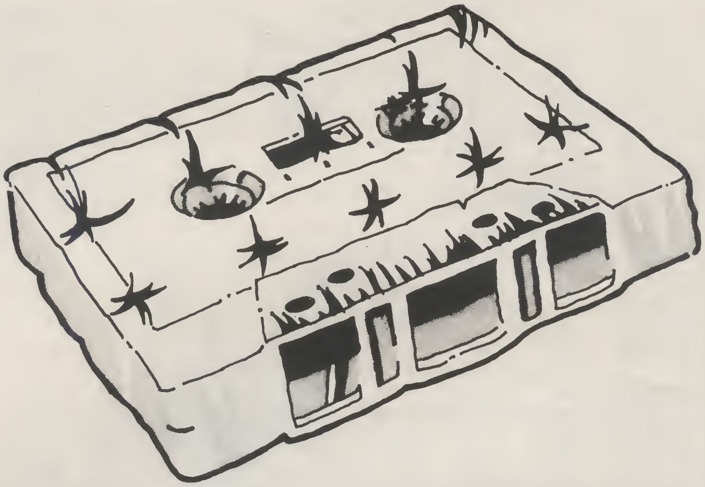
```
7705 LET A$(1)="                  "
7708 LET A$(2)="                  "
7710 LET A$(3)="                  "
7712 LET A$(4)="                  "
7715 LET A$(5)="                  "
7718 LET A$(6)="                  "
7720 LET A$(7)="                  "
7722 LET A$(8)="                  "
7725 LET A$(9)="                  "
7728 LET A$(10)="                  "
7730 LET A$(11)="                  "
7731 LET A$(12)="                  "
7732 LET A$(13)="                  "
7735 LET A$(14)="                  "
7736 LET A$(15)="                  "
7740 LET A$(16)="                  "
7742 LET A$(17)="                  "
7745 LET A$(18)="                  "
7748 LET A$(19)="                  "
7750 LET A$(20)="                  "
7760 FOR R=1 TO 20
7770 PRINT AT 22-R,0;A$(21-R)
7775 NEXT R
7990 STOP
8000 REM **DISPLAY SCENE**
8010 PRINT TAB 4;"SMAUGS LAIR
BY N.BROOKS."
8050 PRINT AT 5,0;"
         "
8055 PRINT " BATTLE  STATUS 
          "
8060 PRINT "
          "
8065 PRINT " BRICKS OUT      
          "
8070 PRINT " NO. CANNON      
          "
8075 PRINT " CANNONBALLS     
          "
8080 PRINT "
     +    "
```



```
8085 PRINT AT 12,21;"          "
8100 PRINT AT 13,15;"  "
8105 PRINT AT 14,12;"      "
8110 PRINT AT 15,7;"          "
8115 PRINT AT 16,7;"          "
8120 PRINT AT 17,7;"          "
8125 PRINT AT 18,7;"          "
8130 PRINT AT 19,7;"          "
8135 PRINT AT 20,2;"
                "
8136 IF BRIC<250 THEN GOTO 8155
8140 LET E$="          "
8142 LET E=INT (BRIC/1000)
8144 LET F=INT ((BRIC-E*1000)/20
0)
8145 FOR R=0 TO E
8146 PRINT AT 5+R,23;E$
8147 NEXT R
8148 FOR R=0 TO F
8149 PRINT AT 6+E,23+R;E$(1)
8150 NEXT R
8152 PRINT AT 12,23;"      "
8155 PRINT AT 8,13;BRIC
8160 PRINT AT 9,13;GUNS
8170 PRINT AT 10,13;BALL
8200 IF BRIC>=6000 THEN GOTO 710
0
8300 IF GUNS=0 THEN GOTO 7350
8400 IF BALL=0 THEN GOTO 7350
8500 IF ROUT=1 THEN GOTO 7350
8900 PRINT AT 2,0;"CANNON IS ";M
;" MTR FROM CASTLE"
8910 PRINT AT 21,0;"HOW MUCH GUN
POWDER?(25 TO 35LBS)"
8912 INPUT U
8915 IF U<25 OR U>35 THEN GOTO 8
910
8950 PRINT AT 21,0;"ENTER CANNON
 ANGLE (MAX 89 DEG)"
8990 RETURN
9000 REM **INSTRUCTIONS**
9020 PRINT AT 2,0;"YOU ARE THE G
UNNER CAPTAIN ON A"
9025 PRINT "MISSION TO DESTROY T
HE DRAGONS"
9030 PRINT "CASTLE."
9040 PRINT "YOU HAVE 5 CANNON AN
D 12 CANNON"
9045 PRINT "BALLS AT YOUR DISPOS
AL...BUT..."
9050 PRINT "BEWARE...THE SOUND O
F YOUR GUNS "
9055 PRINT "WILL WAKE THE DRAGON
"
9065 PRINT "WHEN HE FLIES TIME S
TANDS STILL"
9070 PRINT "AND ALTHOUGH OF POOR
 EYESIGHT, "
9075 PRINT "HE WILL BREATH FIRE 
AND TRY TO"
9080 PRINT "DESTROY ALL OF YOUR 
WEAPONS. IF HE DOES...RUN FOR YO
UR LIFE."
9090 PRINT "TO DISLODGE MOST BRI
CKS,HIT THE"
9095 PRINT "CASTLE AS HIGH AS YO
U CAN BY"
9096 PRINT "CAREFULLY CHOOSING H
OW MUCH GUN-"
9098 PRINT "POWDER TO USE AND WH
AT ANGLE TO"
9099 PRINT "SET THE CANNON AT.IF
 5000 BRICKS"
9100 PRINT "FALL THEN THE CASTLE
 IS IN RUINS"
9110 PRINT "AND SMAUG MUST SEEK 
A NEW HOLE."
9970 PRINT "*GOOD LUCK* (ANY KEY
 TO START)"
9980 PAUSE 40000
9990 RETURN
```

The soft touch

The latest releases for the ZX Spectrum — James Walsh gives us his opinions!



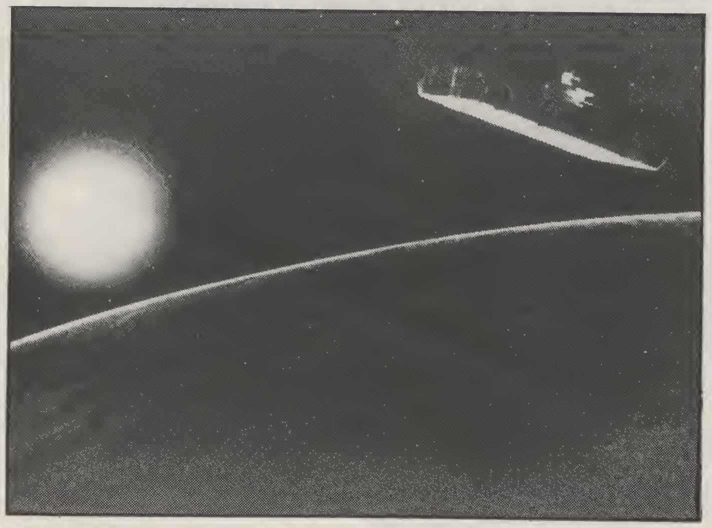
Invasion Of The Body Snatchers — Crystal Computing

Contrary to expectation, there have been very few implementations of the popular arcade game 'Defender' for the Spectrum. This has had little to do with the actual marketability of the game, as can be seen from the quality of sales made on those available. This lack of competition has been to the disadvantage of the games player.

Till now, with the introduction of the Invasion of the Body Snatchers, from Crystal. 'I.O.B.S.', which is a full implementation of the arcade game, includes a full radar, Hall of Fame, etc. Obviously few points can be awarded for originality, but on the other hand it is the quality of the implementation which puts it so far above the rest. The explosions, especially those of yourself are graphically fantastic — see the original. Movement of yourself, the enemy and the bodies is not just smooth, but *very* smooth and fast, very fast.

As more and more aliens materialize on the screen the whole game gets frantic indeed. All the normal functions are available — forward, reverse, fire and smart bombs. Firing is not auto repetitive which makes the game more difficult still. Scoring is on-screen, with bonuses added for the number of bodies left after each wave of attackers. If, of course, you manage to score one of the top scores you can enter your name (or message) on the Hall of Fame.

Sound on the Spectrum could hardly do justice to such an impressive program, so Crystal have opted to support the Fuller Music Box only. This is rather awkward for those who do not own one, but another sacrifice which would have to be made when using the Spectrum's own sound is that of speed. The Spectrum does not allow you to send a sound to the noise circuitry and let it get on with the production whilst you get on with the rest of the program — the Fuller Box does, hence allowing the game to run faster. Not surprisingly the sound effects produced are very good, a credit to both Crystal and Fuller.



As often is the case, life is made a great deal easier with the use of a joystick, and this game is no exception. Fast and precise actions are the name of the game, a very enjoyable and addictive game. Highly recommended.

Transam — Utlimate

Transam is one of the latest offerings from Ultimate — originators of Pet-Pac and Pssst. Transam follows the tradition of quality graphics and simple but relatively original aims. The scenario: 'It is the year 3472 and all that remains on Earth are remnants of a once great continent, a barren land...your aim, in the Super Brown Red Racer, equipped with advance technology, is to regain the eight trophies from the Deadly Black Turbos.

The scenario is corny, but what to the game itself? You have four car controls, either available from the keyboard or via a joystick. They are: anticlockwise rotate, clockwise rotate, brake and accelerator. There is also Pause, temporarily to halt the game. The actual aim of the game, in plain English this time, is to travel over America searching for the eight 'Great Cups of Ultimate'. Along the way it will be necessary to keep filled up with petrol', I do not worry, there are petrol pumps in this desolate place of sand, rocks and boulders! Various objects will appear in your patch and, of course, the 'Deadly Black Turbos' will attempt to make you crash.

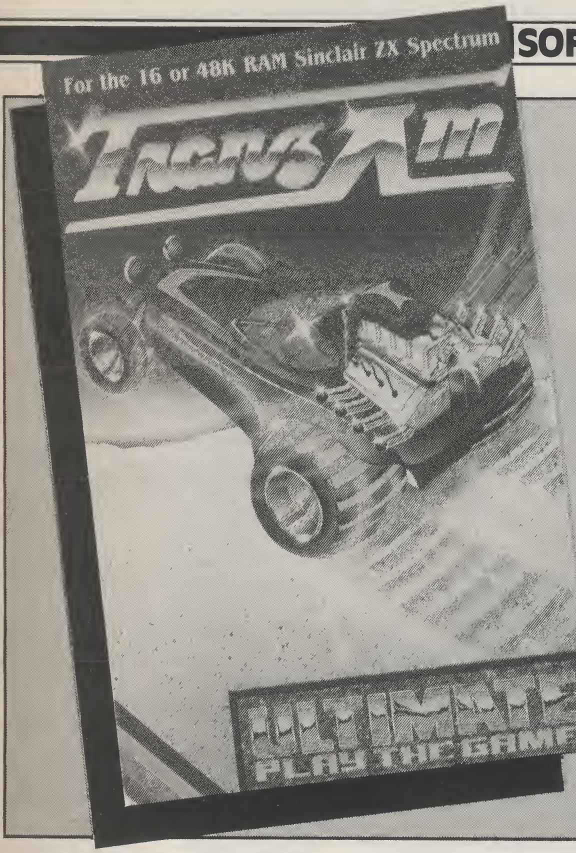
The display is 2D with your car starting in the centre of the screen rotating, and with the barren land, etc, moving past. On the left-hand side of the screen is a 'Real Time Clock', ie one that can tell the real time, continuously; a milometer; a complete map of the U.S.A., showing the positions of fuel pumps, cities, etc; and you, the Red Racer, as a flashing character. Moving down to the second half of this display is a speedometer, fuel guage and temperature gauge. There is also a short range radar, showing the positions of cups and the Black Turbos. Finally, the number of cups found and the number of lives left.

The graphics are smooth, fast and of a high quality — just like the other Ultimate games. This, in some respects, is one of my main qualms about Transam — it is very 'Ultimate' in that no new boundaries have been crossed or new ideas used. The game is very professionally written with only one minor 'bug' — the fact that when you reach the boundaries of the U.S your car is simply flipped round, without notice, which can cause problems if a Black Turbo is in close pursuit. Overall, Transam is fun, though less original than Ultimate's previous two. The presentation is excellent, addictive, and well recommended.

Cricket — Cambridge Micro Centre

Cricket from Cambridge Microcomputer Centre comes complete with a B side, Darts (computing really is getting like show biz!). Both games are BASIC, in language and in playing.

The screen is set up with two wickets and 13 men on



display. Each man takes up a single character square, hence the graphic definition is far from wonderful. Before each ball is bowled, the speed must be entered as slow, medium or fast. The ball is shown travelling towards the batsman and then away again. You may control the man nearest the ball to try and stop or catch it. This I found to be a lot harder than expected. A full scorecard and information board is continuously updated and available. Sound effects are existant but rather basic, and not surprisingly for the Spectrum, unrealistic.

Unfortunately, there is little skill required on the part of the player and little incentive from a novel but rather unexciting game.

Darts is very much a B side. You pick a target, the computer throws and hits randomly at that area. Hence no skill is required. No more need to be said about this or the game cassette as a whole.

Maziacs — dK'tronics

Yes, Maziacs is a maze game as the title suggests, but it is *not* a copy of 'Pacman' (sigh of relief). dK'tronics, who have produced other quality products, have done one large step forward from 'Pacman'.

To start, the maze is bigger, in fact, it has no edges, but hundreds of locations. Only about one-fiftieth of the total maze is normally shown on the screen with a full one-twelfth being displayed by the pressing of the appropriate key. A totally new maze is generated on each go, so making for a very varied game.

Dotted all over the maze are swords, prisoners and a pile of treasure, all set into the walls until you collect them. Only one sword may be held at a time, and just one Maziac can be killed with it. A Maziac is a horrible monster that has a tendency to attack you. There are an enormous number of Maziacs milling around all over the maze. If you are sitting down, they will attack and kill. If you are walking, without a sword, then you are more than likely going to be killed. On the other hand, if you are walking, without a sword, the Maziac will die. One of the nicest little things about Maziacs is the fearful fights which they will put up. The aim of the game is to find the treasure. This is not an easy job when you are in a maze of such size. Fortunately, the prisoners will light the way for a short distance. Once the trasure is found, getting it back is far from easy as a sword may not be carried, so the treasure must be dropped before conflict.

On the right-hand edge of the screen is an energy level indicator which can drop very rapidly at times. If it gets to zero you die. To keep energy up it is necessary to eat food also found in the walls.

Maziacs is one of the most exciting games I have played for a while. The graphics are very good, they are smooth and fast. With three levels of play it will be a long time before the game becomes too easy.

A great game and highly recommended.

Terror-Daktil — Melbourne House

Melbourne House have a string of excellent titles to their name, The Hobbit, probably being the most well known. Just from the cover this looks as if it could be a winner.

On loading, a stunning intro screen is displayed — an outline version of the cover, in fact. Once the whole game has loaded the screen just stands still, and gives no indication that it has successfully loaded.

▶

By pressing a key the next display is shown with the top scores in the middle. By pressing another key the game begins. If left for thirty seconds it will enter a limited demo routine.

Now the introductory program begins. Because it is relatively long and merely an intro, it can be missed by pressing the appropriate key. During this routine the display becomes the window of an aeroplane flying through the clouds. Then, as trouble starts, it is possible to see the volcanoes over which you are flying. Finally, after attempts at landing have failed, your plane crashes. Next day you awake to see Terror Daktils flying in the distance.

There are three cannons in a nearby valley. You drag a cannon over and prepare for the onslaught. In the distance, the Terror Daktils look like space invaders moving from left to right and back again in a jerky manner. As they individually fly at you they may be destroyed by a direct hit from the cannon — far more easily said than done. If you survive the first wave of 'Daktils then night falls and day breaks for the next day. If you survive six days a rescue plane will arrive. The Daktils have an affinity for landing on you, hence stunning you till the next day and damaging the cannon beyond repair.

The graphics are quite superb, though jerky at times. The sound is good, though rather overdone at times. Terror-Daktil is a fast, highly addictive and a difficult game to master. The quality of the program itself is up to the best around the Spectrum. It may be thought of as too hard, hence not recommended for most young children.

Melbourne House have succeeded in continuing their tradition with another excellent game.

Luna Crabs — Micromega

You have been sent to one of Saturn's moons to gather data and samples of minerals much needed on the planet Earth. A simple and routine exercise until the bio-sensor detects creatures following you. Suddenly, they start to spit deadly acid balls. You have no alternative but to stop and fight. One caterpillar track on your land crawler has been hit so you may rotate left or right and fire.

The game is in 3D. The screen shows the latest view from inside your crawler. The turret of your gun is shown at the bottom of the screen — if this is hit you die. As the crawler rotates the display moves in one direction or the other. When firing your photon bolt it may be guided to hit one of the rather ferocious Luna Crabs.

Technically the game is good; fine movement though rather jerky in the case of the crabs themselves. The overall graphics are pleasant and enjoyable to look at. It is fast whilst still being relatively easy even for the novice. Micromega have followed a very admirable policy of showing screen photos of the game on the cassette inlay so as to give you, the potential customer, a better idea of the game before buying. On the whole the game is surprisingly easy to handle, though still a challenge after playing a while.

Though it is not up to the top professional standard of such companies as Ultimate, Crystal, etc, it is an enjoyable and surprisingly addictive game to play.

Championship Darts — Shadow Software

Darts is not a game readily associated with computer simulation, hence it takes just that bit extra to design and market a version which competes with the more computer orientated games. Have Shadow Software managed this?

On loading a reasonably good introductory 'screen' is displayed — a good start. To play the game itself a standard board is displayed on the screen, with a line from the centre of the board to the circumference rotating around the centre. It is then up to your judgement as to stopping the line over the desired value. Once the line has been stopped, another display comes into use. A small blob runs backwards and forwards along a line with double, treble, off the board, and 25 shown on it. By pressing a key at the right moment the desired type is selected, with this your score is determined and substracted from the start value. Obviously there is provision for two players but not for the computer to play. The graphics, though not complicated, are quite pleasant, but nothing amazing. Instructions are limited, giving just about enough to go on, but really they should have been rather more comprehensive.

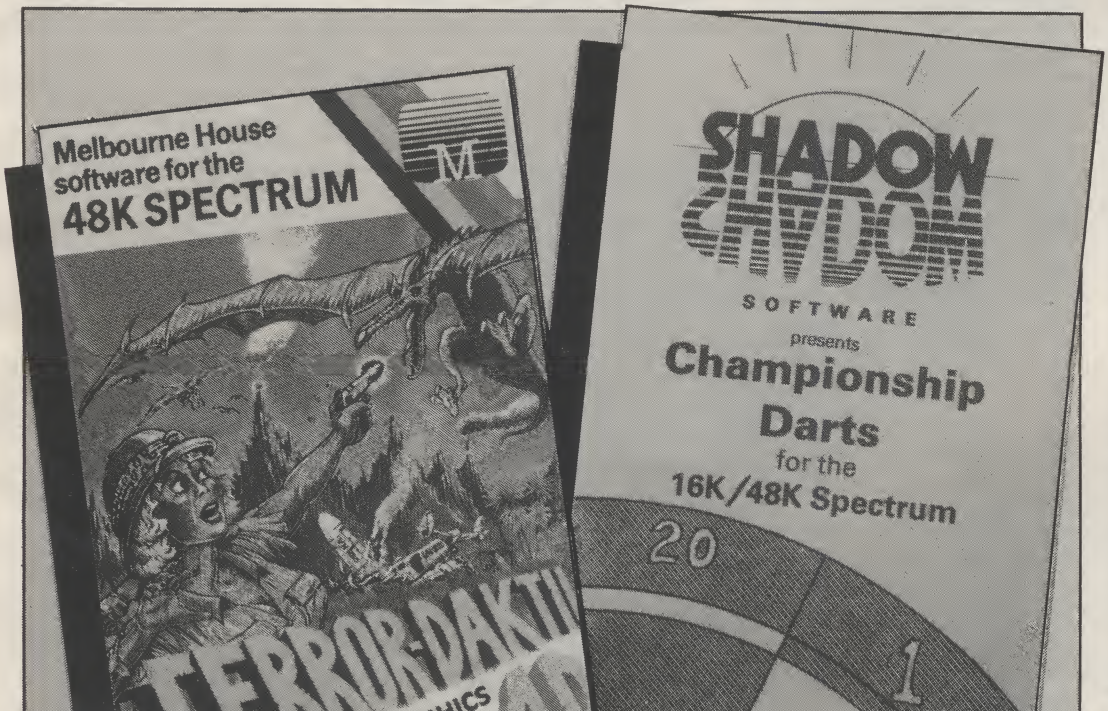
In conclusion it can be said that Championship Darts is nicely put together, quite fun to play, but technically limited by a relatively average program.

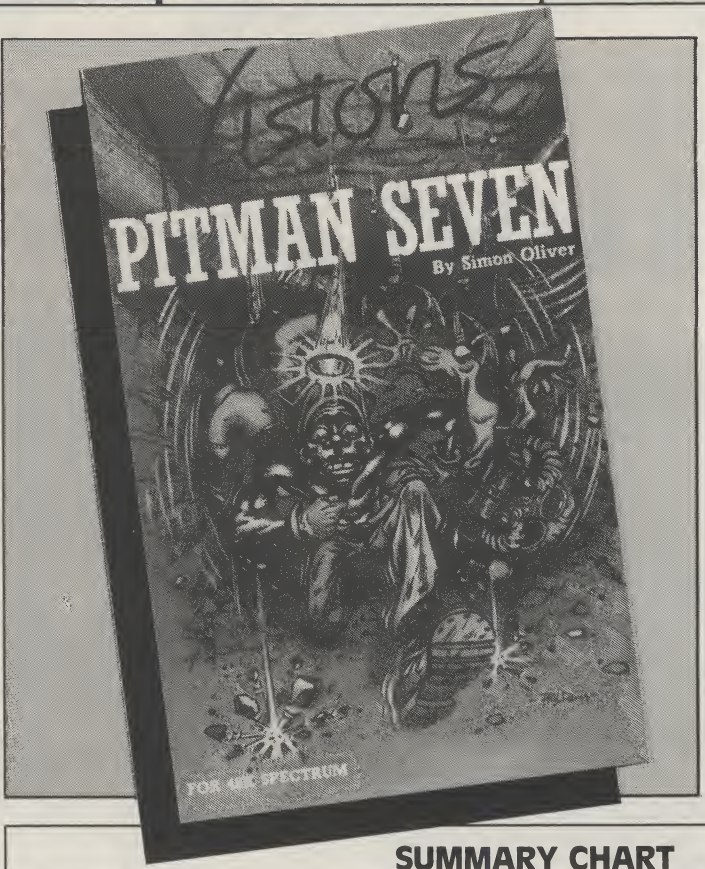
Cyberzone — Crystal Computing

Crystal seem, continously, to be switching between adventure and arcade style games. One of their first games, Merchant of Venus, was an adventure/trader type game but with moving graphics. Cosmic Guerilla is an arcade game, Dungeon Master is an adventure, whilst Halls of the Things is an arcade game but with an adventure type scenario. Cyberzone is a pure arcade game. Unlike Return of the Body Snatchers, it is not an actual copy of a true arcade game but rather a mix up of many different games.

At the top of the screen is a little green man enclosed in a space ship with a revolving floor. By firing at the space ship's floor it will slowly but surely disintegrate. Once it has, to a large enough extent, then you must shoot the alien's left foot!

There must be some hidden meaning behind this!





Fortunately, the game is not quite that easy. Whilst your base runs along the bottom of the screen, the alien ship also has its own laser running along its base. This will fire on all but the lowest of the fire levels. Often, a little fighter aircraft will be sent out by the alien. These swoop their way across and down the screen, occasionally dropping bombs, which must be avoided at all costs. If a fighter aircraft is hit, it will spin over and dive towards the earth. From time to time, the alien ship will drop a scanner ship into the battle. You cannot shoot them, but the fighter aircraft can be enticed into hitting them as can the alien ship's own gun. These scanner shops do not fire at you, but rather at whatever you fire, hence blocking your fire until destroyed or retrieved by the alien ship.

PITMAN 7 — Visions Software Factory

Pitman 7 is a new game a recently-formed company, Visions.

Two teams of seven men are trapped on the fifth level of an underground mine. Your task is to guide each one to the surface through the many tunnels and shafts. Just to make things a little more interesting, rocks are cascading towards you at a frightening velocity. There are a number of ways to avoid these: to jump over them, go through a hatchway onto another level or jump and hang on to bar above parts of the tunnels. If this is not enough, it is then necessary to guide the other team through tunnels filling with a posionous gas. Gas suits are avialable but getting them can be a problem.

Though the scenario may be different, the screen display and basics of the game are the same as 'Donkey Kong', etc. Fortunately, a number of additions have been made to make it rather more varied and exciting game than 'Donkey Kong' itself. The quality of graphics is quite good, though a little jerky and not as detailed as some of the other games I have seen.

In many ways, it comes as an advanced version of 'Donkey Kong' which will appeal to 'Donkey Kong' addicts, but with a new story line, which gives is new life.

Pitman Seven must rate as one of the better copies of arcade games. Fortunately, the extended scenario puts it out as a great game in its own right, and a very good one at that!

* Stop Press *

Late news from Crystal Computing. They are to launch a new game called Rommel's Revenge. So what I hear you say. Rommel's Revenge is a 'Battle Zone' copy to beat all arcade game copies. As yet I have only seen a pre-production version, but with stunning 3D graphics, blocks, pyramids, continously rotating radar towers, tanks, as well as space ships and rotationally scanning radar, we are talking about a very special piece of software. It will be blasting its way on to the market during November. Watch this space for a full review in the next edition.

Two editions ago I reviewed Dungeon Master by Crystal. It came out very well. Since then vast improvements have been made with the addition of a number of machine code routines and new facilities.

SUMMARY CHART

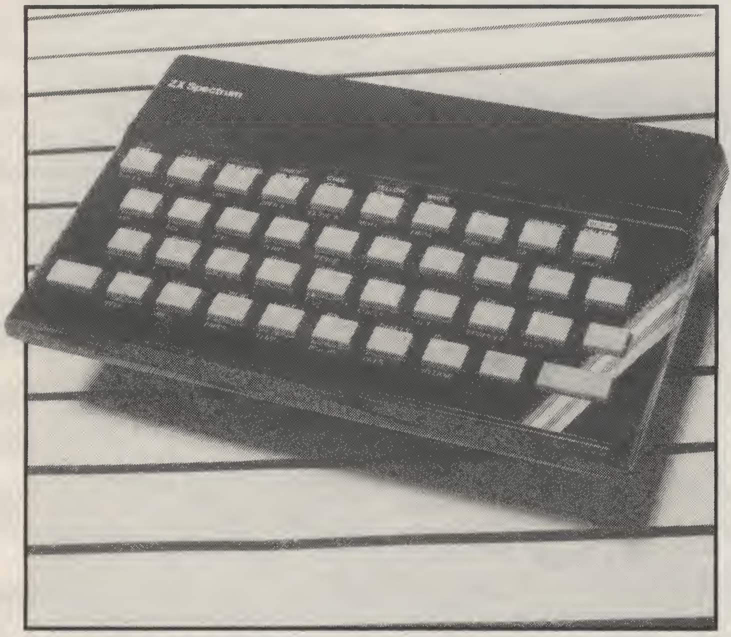
Names	Memory Required	Documentation	Addictive Quality	Graphics	Programming Achievement	Lasting Appeal	Value
Maziacs	48	4	4	4	4	4	4
Transam	16	4	3½	3½	3½	3½	3½
Championship Darts	16	3	3	3	3	2½	3
Pitman 7	48	3½	4½	3½	3½	4	4
Terror Daktil	48	4½	4½	4½	4½	4½	4½
Luna Crabs	16	4½	4½	4	4	4	4½
Invasion of the Body Snatchers	48	4	5	4½	4½	4½	4½
Cricket	48	4	3	2½	3	3	3
Cyberzone	16	4	4	4	4	4	4

Addresses

Cambridge Microcomputer Centre, 153-4 East Road, Cambridge.
Ultimate, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU.
Visions (Software Factory) Ltd, 1 Felgate Mews, Studland Street, London W6 9JT.
dK'tronics Ltd, Shire Hill Industrial Estate, Saffron Walden, Essex.
Melbourne House, 131 Trafalgar Road, London SE10.
Micromega, 230-236 Lavender Hill, London SW11 1LE.
Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR3 3RX.
Shadow Software, 8 Hallgate, Thurnscoe, nr Rotherham, S. Yorkshire S63 OTU.

Block deletion

A useful utility for the Spectrum, courtesy of Rodney Francis of Essex.



This program in machine code, with a BASIC starter, has been written to provide a very fast method of deleting a block of BASIC program. It saves all the tediousness of deleting one line at a time.

The machine code is relocatable anywhere above RAMtop, but for demonstration purposes it starts at address 32000 (7D00 Hex). If it is relocated, the last line of the BASIC program must be altered accordingly.

The BASIC program, which has been deliberately numbered to be at the end of your own program and is called by a GO TO 9992 command, starts by asking for the limiting line numbers. These are checked for obvious inconsistencies and are then POKEd into a temporary store in the printer buffer for use by the machine code routine. The machine code routine is then run. All that is now necessary is to delete the first line number of the block in the normal way.

Care should be taken to ensure that both the first and last line numbers actually exist in the program. If the first line does not exist the result will not be too disastrous, but you will have to delete the next existing line number in the normal way to complete the deletion. However, more critical would be entering a last line which does not exist, because the resulting deletion would include the next existing line following the line entered.

The BASIC starter is shown in Fig. 1. The mnemonics and description of the machine code routine are shown in Fig. 2.

```
9991 STOP
9992 INPUT "Enter first line no.
 ";line1
9993 INPUT "Enter last line no.
";line2
9994 IF line1>line2 OR line1<1 O
R line2>9999 THEN GO TO 9992
9995 POKE 23296,line1-256*INT (l
ine1/256)
9996 POKE 23297,INT (line1/256)
9997 POKE 23298,line2-256*INT (l
ine2/256)
9998 POKE 23299,INT (line2/256)
9999 RANDOMIZE USR 32000
```

Fig. 1. The BASIC starter program.

ld hl,(23296) call 6510 inc hl inc hl push hl	Find the address of the first byte of the line length for the first line to be deleted and put it on the stack.
ld hl,(23298) call 6510 inc hl inc hl	Find the address of the first byte of the line length for the last line to be deleted.

ld e,(hl)
inc hl
ld d,(hl)
inc hl
add hl,de
	Find the length of the last line and hence find the address following the end of the last line.

pop de push de and a sbc hl,de dec hl dec hl	Recover the address of the first byte of the line length of the first line to be deleted and restore it on the stack; then calcualte the total number of bytes (excluding the first four) to be deleted.

ex de,hl
pop hl
ld (hl),e
inc hl
ld (hl),d
ret
	Insert this number into the line length of the first number to be deleted.

Fig. 2. The mnemonics and description of the machine code routine.

The deletion of the first line causes the deletion of the whole block because the machine code routine has altered its line length to include all the following data which is to be removed. The computer now thinks that the first line of the block extends to the end of the last line.

To cater for both decimal and hexadecimal buffs, the machine code listing for both are given in Fig. 3.

```
32000       42                 7D00    2A
32001       0                  7D01    00
32002       91                 7D02    5B
32003       205                7D03    CD
32004       110                7D04    6E
32005       25                 7D05    19
32006       35                 7D06    23
32007       35                 7D07    23
32008       229                7D08    E5
32009       42                 7D09    2A
32010       2                  7D0A    02
32011       91                 7D0B    5B
32012       205                7D0C    CD
32013       110                7D0D    6E
32014       25                 7D0E    19
32015       35                 7D0F    23
32016       35                 7D10    23
32017       94                 7D11    5E
32018       35                 7D12    23
32019       86                 7D13    56
32020       35                 7D14    23
32021       25                 7D15    19
32022       209                7D16    D1
32023       213                7D17    D5
32024       167                7D18    A7
32025       237                7D19    ED
32026       82                 7D1A    52
32027       43                 7D1B    2B
32028       43                 7D1C    2B
32029       235                7D1D    EB
32030       225                7D1E    E1
32031       115                7D1F    73
32032       35                 7D20    23
32033       114                7D21    72
32034       201                7D22    C9
```

Fig. 3. The decimal and hexadecimal listing of the machine code listing.

sinclair special

5

Inside...
New Interface 2 and ROM cartridges!
New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software.Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Computers

Chess Tutor 1

For 48K RAM Spectrum. £9.95.

Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.

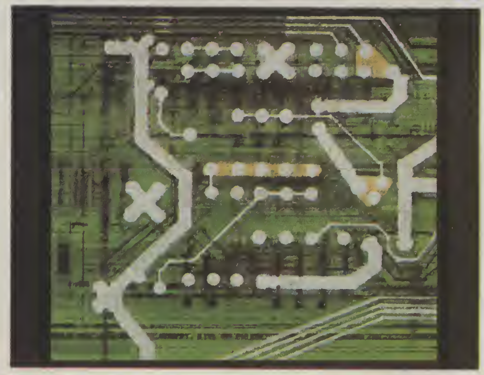
Musicmaster

For 48K RAM Spectrum. £9.95.

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



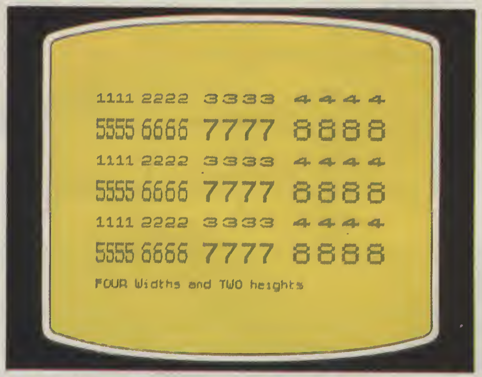
Make-a-Chip

For 48K RAM Spectrum. £9.95.

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

Make-a-Chip is a fascinating way of finding out how computer logic works.



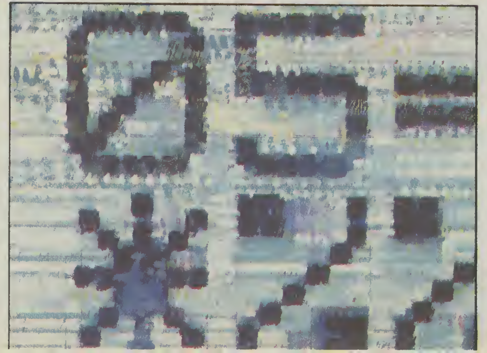
```
1111 2222 3333 4444
5555 6666 7777 8888
1111 2222 3333 4444
5555 6666 7777 8888
1111 2222 3333 4444
5555 6666 7777 8888
FOUR Widths and TWO heights
```

Print Utilities

For 16K and 48K RAM Spectrum. £9.95.

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM-Spectrum. £9.95.

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly!
Takes two joysticks!
Just plug-in and play!

SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!

...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

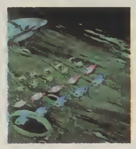
And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon

Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

New! PSSST

Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess

This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids

Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace

Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am

Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders

Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie

You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac

As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE

NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

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Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you by return.

The new ZX Microdrive System. Each Microdrive: £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

ORDER FORM

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

Section A: Hardware

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	ZX Interface 2	8501	19.95	
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E7/S	Musicmaster	4306	9.95	
E8/S	Beyond BASIC	4307	9.95	
E6/S	Make-a-Chip	4305	9.95	
L5/S	Print Utilities	4404	9.95	
			TOTAL £	

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no:

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

ZXC 912

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications (tick here). You can use the above form to send us your name and address.

Minefield

Watch your step in this program by Stan Hatton of Pontefract.

All you have to do in this game for your ZX81 is to establish a safe route through a minefield you know to be planted with 13 deadly mines.

To the death

Your mission is of the suicide variety and of the utmost importance — vital to the war effort in the war you have happened on. And that is why to a certain degree your lives are expendable. You command three men and their task is to beat a path through the minefield — at least one of your men must get through as three explosions will alert the enemy that someone is trying to cross their defences and your mission will be over.

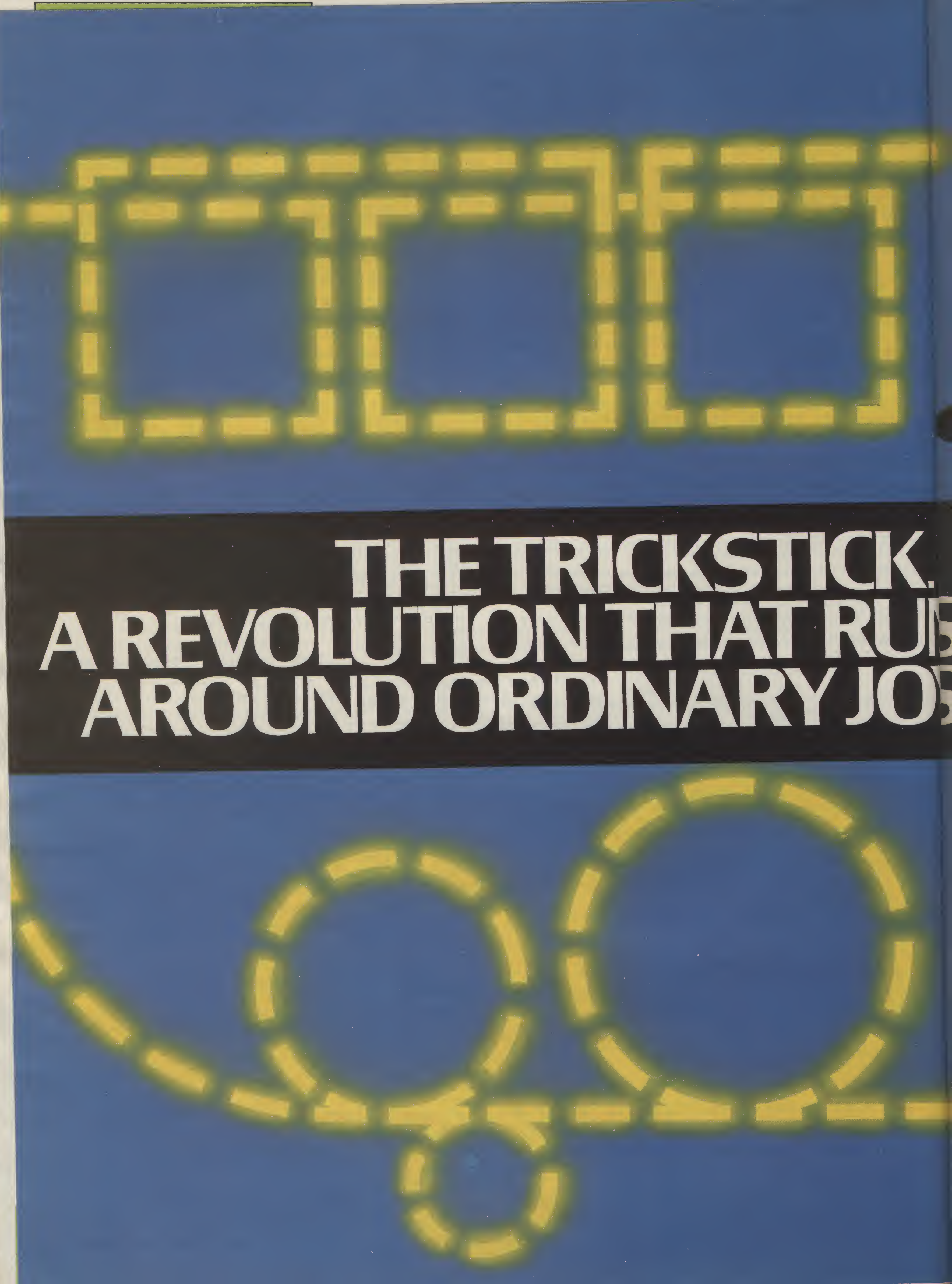
You move your men across using the cursor keys. No clues or hints are given as to where the mines have been hidden — you must manoeuver your men purely on instinct. Good luck!

Line by line

Here follows a brief breakdown of the program, line by line:

Lines 5-35	Set up the variables used throughout the program.
Lines 40-55	Provide the geographical parameters of the minefield in which to confine the random deployment of mines.
Lines 60-75	The random deployment of the mines in the minefield.
Lines 80-120	The minefield screen display.
Lines 125-190	Control the movement of the men. (Lines 155-170 compare the men's movements with the 13 mine positions.)
Lines 195-225	Control the end of the game and the re-start if required.
Lines 1000-1030	Contain the code for the word 'START' to flash on the screen at the start of the game.
Lines 2000-2080	Contain the routine for what happens, explosions, etc, when one of your characters steps on one of the hidden mines.
Lines 3000-3030	Contain the code for the word 'HOME' to flash on the screen when you have managed to cross the minefield with one of your characters.

```
   1 REM :SET UP VARIABLES,ETC.
   5 RAND 0
  10 DIM L(13)
  15 DIM C(13)
  20 LET L=21
  25 LET C=1
  30 LET G=1
  35 LET M=157
  40 LET A=18
  45 LET B=3
  50 LET D=31
  55 LET E=0
  59 REM :SECRET RANDOM DEPLOYME
NT  OF MINES.
  60 FOR N=1 TO 13
  65 LET L(N)=INT (RND*(A-B+1)+B
)
  70 LET C(N)=INT (RND*(D-E+1)+E
)
  75 NEXT N
  79 REM :MINEFIELD SCREEN DISPL
AY.
  80 PRINT AT 0,0;"HOME"
  85 PRINT AT 2,0;"XXXXXXXXXXXX
XXXXXXXXXXXXXXXXX X"
  90 PRINT AT 11,11;"MINEFIELD"
  95 PRINT AT 19,0;"X XXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX"
 100 PRINT AT 21,21;"▚ ▚ ▚ START
"
 104 REM :PRESS NEWLINE TO RESTA
RT PROGRAMME AT YOUR OWN PACE.
 105 INPUT P$
 110 GOSUB 1000
 120 PRINT AT 21,21;" ";AT 21,1;
CHR$ M
 124 REM :MOVE AND CONTROL MEN.
 125 IF INKEY$="5" THEN LET C=C-
1
 130 IF INKEY$="6" THEN LET L=L+
1
 135 IF INKEY$="7" THEN LET L=L-
1
 140 IF INKEY$="8" THEN LET C=C+
1
 145 IF L=1 AND C=30 THEN GOTO 1
95
 150 IF M=0 THEN GOTO 195
 155 FOR N=1 TO 13
 160 IF L=L(N) AND C=C(N) THEN G
OSUB 2000
 165 NEXT N
 170 PRINT AT 21,1;" "
 175 FOR T=1 TO 12
 180 NEXT T
 185 PRINT AT L,C;CHR$ M
 190 GOTO 125
 194 REM :CLOSE OF GAME AND REST
ART.
 195 FOR N=1 TO 13
 200 PRINT AT L(N),C(N);"*"
 205 NEXT N
 210 GOSUB 3000
 215 STOP
 216 REM :PRESS CONT FOR ANOTHER
 GAME AT YOUR OWN PACE.
 220 CLS
 225 GOTO 5
 999 REM :GOSUB 1000 "START" MAD
E TO FLASH FOR EFFECT.
1000 FOR N=1 TO 10
1005 PRINT AT 21,27;"     "
1010 FOR T=1 TO 12
1015 NEXT T
1020 PRINT AT 21,27;"START"
1025 NEXT N
1030 RETURN
1999 REM :GOSUB 2000 WHAT HAPPEN
S WHEN YOU STEP ON A MINE.
2000 FOR T=1 TO 50
2005 FAST
2010 NEXT T
2015 SLOW
2020 PRINT AT 11,11;" MAN DEAD"
2025 FOR T=1 TO 50
2030 NEXT T
2035 PRINT AT L(N),C(N);"*"
2040 LET M=M+1
2041 IF M=160 THEN LET M=0
2045 LET G=G+1
2050 LET L(N)=21
2055 LET C(N)=0
2059 REM :PRESS NEWLINE AT YOUR
OWN PACE TO CALL UP NEXT MAN.
2060 INPUT P$
2065 PRINT AT 11,11;"MINEFIELD"
2070 PRINT AT 21,(21+G);"  "
2075 PRINT AT 21,1;CHR$ M
2080 RETURN
2999 REM :GOSUB 3000 "HOME" MADE
 TO FLASH FOR EFFECT.
3000 FOR N=1 TO 10
3005 PRINT AT 0,0;"    "
3010 FOR T=1 TO 12
3015 NEXT T
3020 PRINT AT 0,0;"HOME"
3025 NEXT N
3030 RETURN
4000 REM :END OF PROGRAMME.
4001 REM :GOOD LUCK.......
4002 REM :.....YOU,LL NEED IT.
```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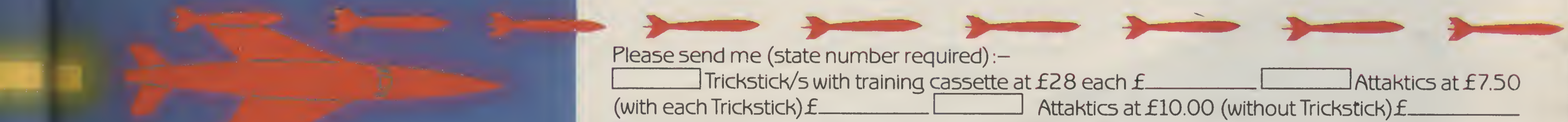

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EAST LONDON
ROBOTICS

Competition

Win some Spectrum software in this easy-to-enter competition...

After drawing so much on your creative spirit in past competitions in ZX Computing, here's a fairly easy task for you to carry out.

All you have to do is to search the wordsquare below for the titles of some of the most popular software on the market. And to make it really easy for you, we've provided the names of the packages included in the wordsquare. Unfortunately for you, though, not all the names in the list are included in the wordsquare — you'll have to find out how many actually are included.

To enter the competition, simply ring around the software titles you have found and count them. Then fill in the coupon and send it off to us complete with your name and address. But, please remember to put the number of software titles you have found on the back fo the envelope.

MANIC MINER
THE HORBIT
HALLS OF THE THINGS
ARCADIA
ASTEROIDS
BLACK CRYSTAL
COSMOS
DO NOT PASS GO
GREEDY GULCH
GULPMAN
FLIGHT SIMULATION
PENETRATOR
HUNGRY HORACE
INCA CURSE
MINED OUT
FOOTBALL MANAGER
MAZOGS
NIGHT GUNNER
SCHIZOIDS
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ESCAPE
KRAZY KONG
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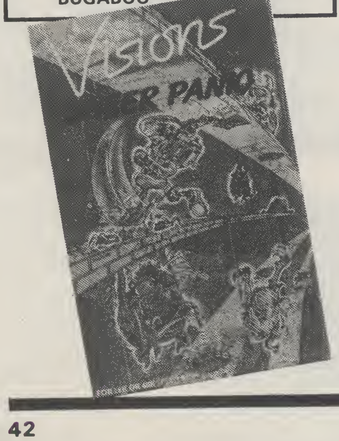

The prizes

There will be six winners to this competition, each picked at random from the Editor's hat.

Each of the six prize winners will receive a special T-shirt with the Visions Software Factory logo on the front and the *ZX Computing* logo on the back. These T-shirts are being specially manufactured for the competition — so, you can wear your orginial T-shirt with pride!

Along with a unique T-shirt you will also receive one of each of the following Visions software packages for the ZX Spectrum:

Pitman 7
Sheer Panic
Rapedes
Snooker
Star Warrior
Orpheus
Sci-Fi

N	O	I	T	A	L	U	M	I	S	T	H	G	I	L	F
O	L	T	U	L	N	C	Z	A	D	R	R	L	S	O	D
M	A	Z	O	G	S	G	R	M	K	O	C	R	O	F	E
H	T	O	D	M	E	C	B	E	T	G	E	T	M	O	I
C	S	B	E	J	A	E	Q	A	I	N	B	I	S	A	Z
I	Y	W	N	D	C	K	R	D	I	A	U	B	O	V	B
E	R	N	I	E	M	T	R	M	L	S	D	B	C	H	K
D	C	A	M	A	E	F	C	L	S	B	N	O	E	R	G
I	K	G	T	N	L	I	M	Z	C	O	U	H	T	E	N
U	C	E	E	U	N	A	P	K	H	J	A	E	H	O	O
F	A	P	L	A	N	E	T	O	I	D	S	H	R	I	K
K	L	I	M	A	E	S	B	L	Z	O	I	T	E	C	Y
B	B	U	G	A	B	O	O	N	O	F	E	A	Z	L	Z
O	J	E	S	C	A	P	E	B	I	I	U	O	K	S	A
E	R	K	C	P	I	G	M	R	D	I	P	D	C	O	R
T	Z	D	O	N	O	T	P	A	S	S	G	O	E	G	K

Name . . . .
Address . . . .
. . . .
. . . . **Postcode** . . . .

I have found .... software titles in the wordsquare.

So, good luck and please remember to put the number of titles you find on the back of the envelope.

Rules

- This competition is open to all UK and Northern Island readers of *ZX Computing*, except employees of Argus Specialist Publications Ltd, their printers and distributors , employees of the Visions Software Factory, or anyone associated with the competition.
- As long as the correct coupon is used for each entry, there is no limit to the number of entries from each individual.
- All entries must be postmarked before January 31st, 1984. The prizes will be awarded to the first six entries picked at random which have the correct answers, the decision to be made by the Editor of *ZX Computing*. No correspondence will be entered into with regard to the results and it is a condition of entry that the Editor's decision is accepted as final.
- The winners will be notified by post and the results will be published in a future issue of *ZX Computing*.

Address your entries to:

ZX Computing — Wordsquare
145 Charing Cross Road',
London WC2H OEE.

Results

Congratulations to Ian Foster of Harrow, Roy Lane of Ripon and Paul Russell of Dunbartonshire for you have won the competition set in the Aug/Sep issue of *ZX Computing*. Rest assured, your AGF Hardware joystick package is on its way to you.

Thank you to everyone else who entered the competition — better luck next time!

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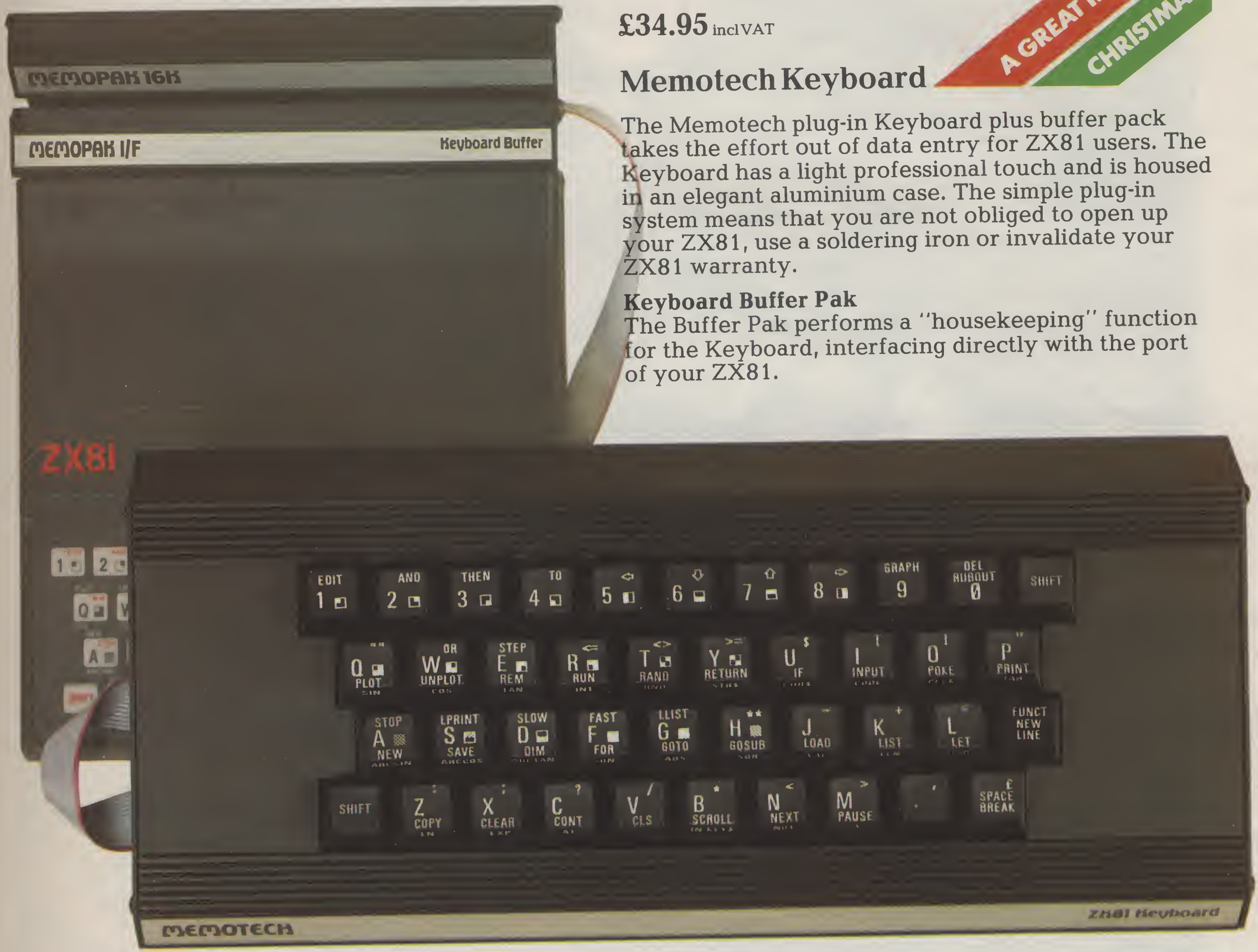

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The complete range

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The Assembler allows you first to code and edit a source program in the Z80 language, and then assemble it into machine code. You can now write flexible and economic programs. The Editor mode allows you to code directly in the right format, manipulate individual lines and control the exact placing of source and machine code. Routines may be merged or listed (even to a commercial printer using our Centronics Interface). The assembler mode handles all standard Z80 mnemonics, numbers in hex or decimal, comments and user-selected labels.
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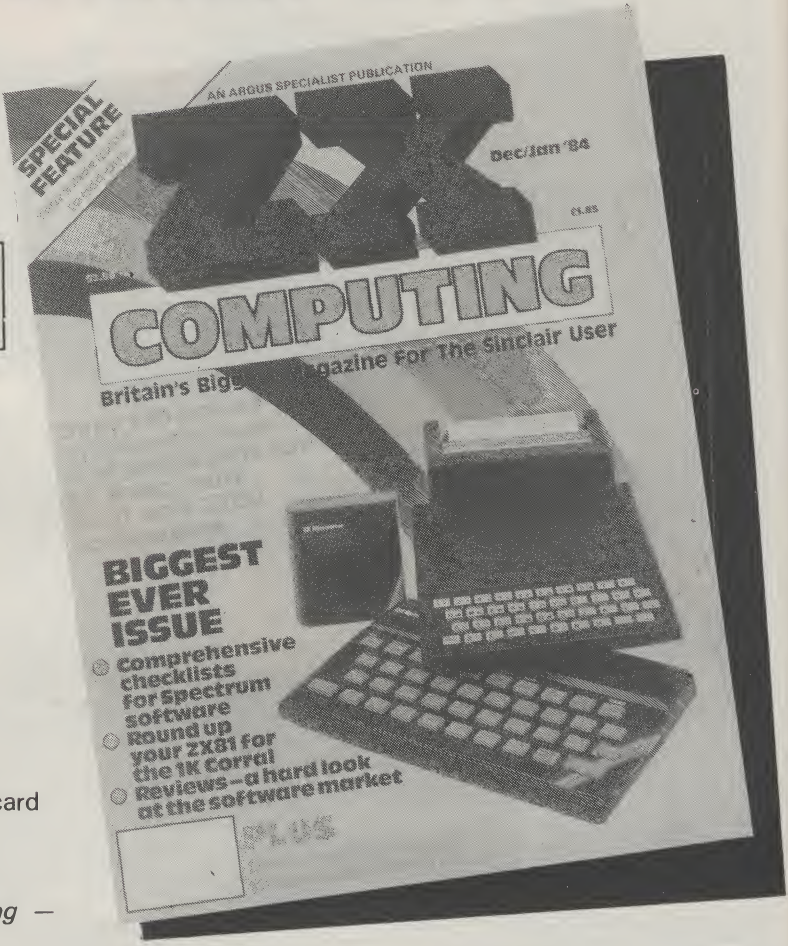
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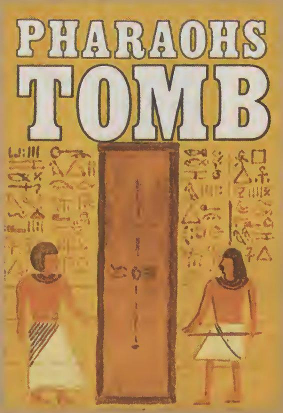

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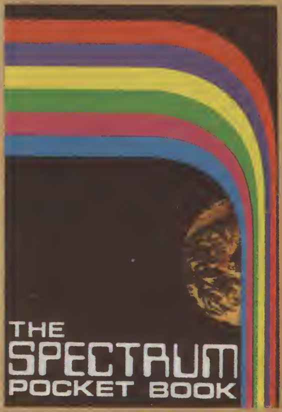

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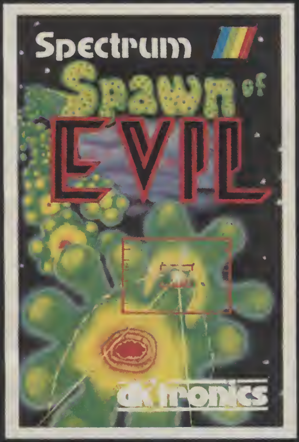

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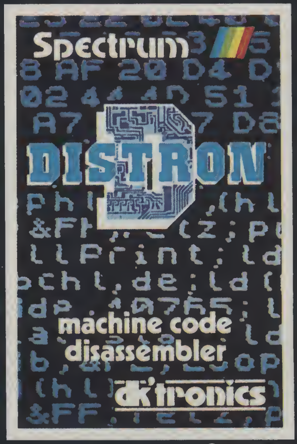

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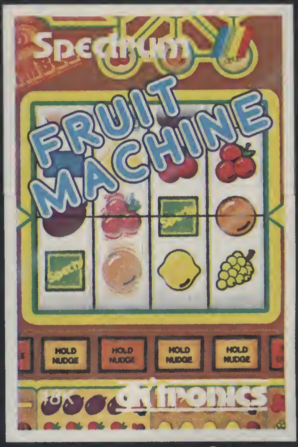

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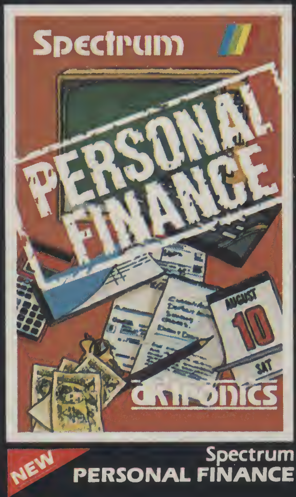

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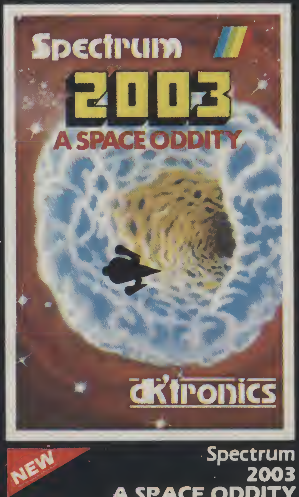

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THE SLICKER PUZZLE

NEW
Spectrum
MAZIACS

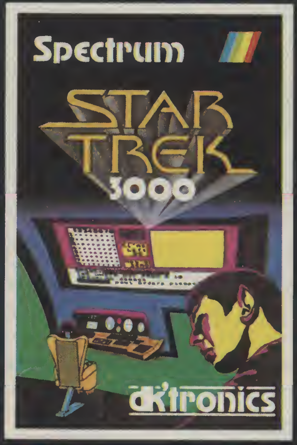
Spectrum
GOLD MINE

NEW
Spectrum
DIET

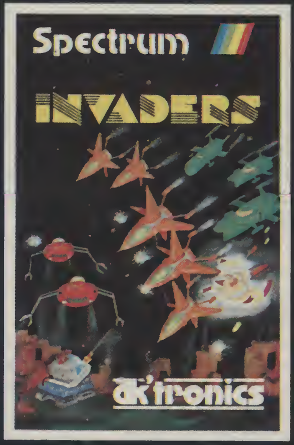
NEW
Spectrum
SPEED DUEL

NEW
Spectrum
GOLF

Spectrum
ROAD TOAD



NEW
Spectrum
STAR TREK 3000

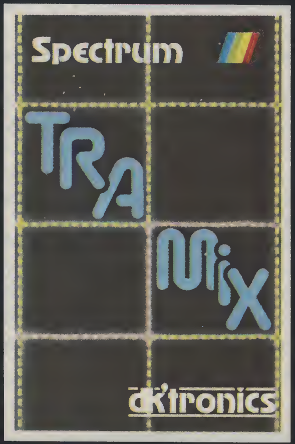


Spectrum
INVADERS

Spectrum
JAWZ

NEW
Spectrum
HARD CHEESE

NEW
Spectrum
MUNCH MAN



NEW
Spectrum
TRAMIX

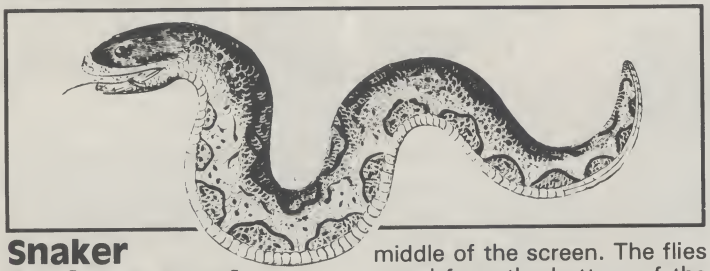
NEW
Spectrum
GALACTIANS

The 1K corral

A galaxy of great programs rounded up for your 1K ZX81.

Although sometimes frustrating to work within the limited confines of 1K of memory, you may find it worthwhile to study how programmers have managed to utilise the memory space — something you may (and should) find useful even when working within 16K or 48K.

If you would like to contribute material to this feature, please try to explain the techniques you have employed to get your program into 1K. And now, on with the show . . .



Snaker
Andrew Ford

In this program, you must guide a snake's head (represented by an 'S') to catch the flies (represented by the 'I' characters). There is a time limit set and you must use the '5' and '8' keys to move left and right respectively.

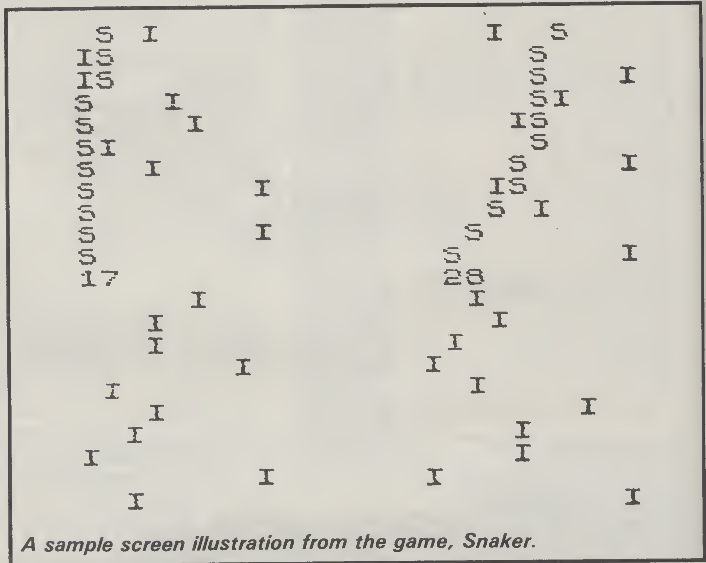
When the program is run, your snake is printed in the middle of the screen. The flies travel from the bottom of the screen to the top, and it is your task to eat as many flies as possible in the time limit. When you time has run out, your score will be displayed by the head of the snake.

Program breakdown

Here is a brief guide to the listing, line by line:

Lines 10-20	Set the time limit and zero the score.
Lines 30-40	Set I and J as variables for use within the program.
Lines 50-60	Set the X and Y co-ordinates.
Line 70	Sets a random number between 10 and 20 for the position of the flies.
Line 80	Prints the snake's head.
Line 90	Prints the fly at the bottom of the screen.
Line 100	Controls the movement of the snake's head.
Lines 110-120	Check the display file to see if a fly has been eaten, and if it has add one to the score.
Lines 130-140	Reduce the time by one unit and check to see if the time has reached zero.
Line 150	Scrolls the screen.
Line 170	Prints the score.
Lines 180-200	Wait for a key to be pressed — if a key is pressed the screen is cleared and the program is run.

```
10 LET B=VAL "100"
20 LET S=PI-PI
30 LET I=PI/PI
  40 LET J=CODE "▒"
  50 LET X=J
  60 LET Y=X
  70 LET R=INT (RND*J)+J
  80 PRINT AT X,Y;CHR$ 56
  90 PRINT AT CODE "+",R;CHR$ 45
 100 LET Y=Y+(INKEY$="8" AND Y<C
ODE "<")-(INKEY$="5" AND Y>J)
 110 PRINT AT X+I,Y;
 120 IF PEEK (PEEK 16398+256*PEE
K 16399)=CODE "I" THEN LET S=S+I
 130 LET B=B-I
 140 IF B=PI-PI THEN GOTO VAL "1
70"
 150 SCROLL
 160 GOTO VAL "70"
 170 PRINT S
 180 PAUSE 4E4
 190 CLS
 200 RUN
```



```
 S  I                  I  S
IS                       S
IS                       S    I
S    I                   SI
S     I                 IS
SI                       S
S   I                   S     I
S         I            IS
S                      S  I
S         I           S
S                   S         I
17                  28
      I               I
    I                  I
    I                I
         I         I
 I                    I
    I                       I
   I                    I
I                       I
          I        I
   I                          I
```

A sample screen illustration from the game, Snaker.

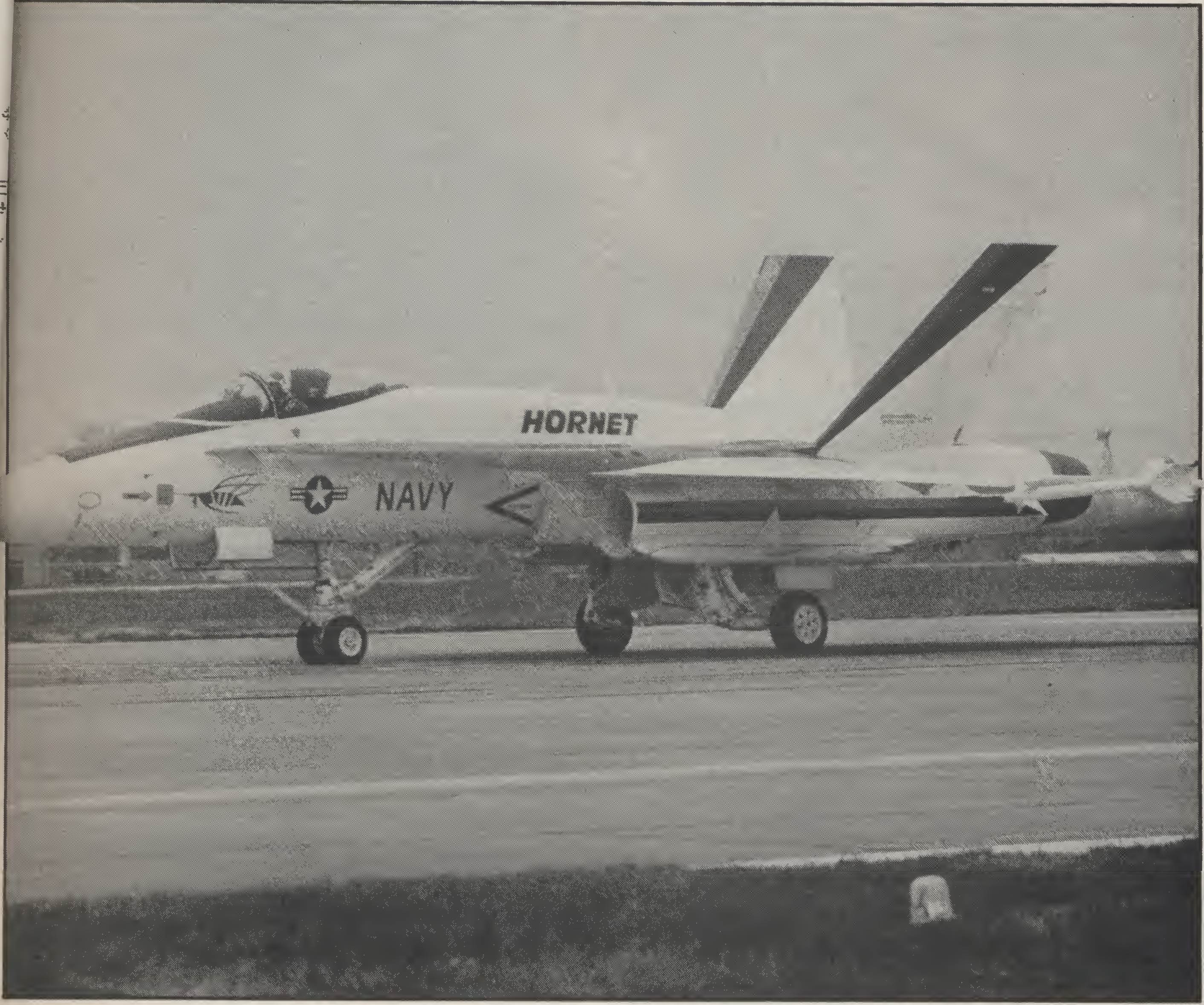
Ghost hunt
A Murray

In this game, you must try and stop the ghost from reaching you — not an easy task as you will soon find out!

You can manoeuvre your character up and down using the '1' and 'A' keys respectively, and you can fire at the ghost using the 'P' key as your laser.

You will score one point for each ghost you destroy, the score being displayed when you are reached by the ghost. To make sure of destroying a ghost you must aim your laser at the ghost's head, and be sure not to keep your finger on the 'P' key for too long.

```
  5 LET S=0
 10 LET A=5
 15 LET B=0
 20 LET C=10
 25 LET D=29
 30 LET X=INT (RND  * 3)
 40 PRINT AT C,D; ''space, inverse quotation mark'';
    AT C+2, D; ''graphic T, inverse space, graphic Y'';
    AT C+1,D; >''graphic 3, graphic 7, graphic 4''
 50 PRINT AT A,B; ''inverse> ''
 60 LET D=D-1
 70 IF X=0 AND D>23 THEN LET C=C+1
 80 IF X=0 AND D>11 AND D<22 THEN LET C=C-1
 90 IF X=1 AND D=22 THEN LET C=C-5
100 IF X=2 AND D=22 THEN LET C=C+1
110 IF D>3 AND D<10 THEN LET C=C+1
120 IF INKEY$ = ''P'' AND A=C THEN LET S=S+1
130 LET A=A+(INKEY$=''A'') - (INKEY$=''1'')
140 IF INKEY$=''P'' AND A=C THEN GOTO 10
150 IF D=1 THEN GOTO 180
160 CLS
170 GOTO 40
180 PRINT AT 10,20; ''SCORE='';S
```



Happy landings

Christopher Dawber

In this program you must land your aircraft on the runway beneath you and bring it to a halt. It is advisable to lose as much speed at over half the height you start at because your fuel will decrease by the amount of the number (your speed) below the runway displays. You can decrease your speed by pressing the '5' key. Do not lose too much speed above half height or you will inevitably crash.

Once you are below half height, you must land on the runway, but do not decrease your speed after the asterisks or before the Graphic 2.

To lower your aircraft, you must press the '6' key — but take care as you cannot make the aircraft go up again. If you don't land and you pass the asterisks, you will come to a sticky end.

```
  1 LET X=PI-PI
  2 LET Z=PI/PI
  3 LET H=Z
  4 LET S=CODE ''graphic shifted S''
  5 LET F=CODE ''graphic space''
  6 LET L=X
  7 LET A$=''10 graphic shifted A, graphic 1, 10 graphic
    shifted A, graphic 2, 5  graphic A, 10 graphic  *''
100 PRINT AT H-Z,X;''3 spaces'';AT H,X;''graphic shifted
    W,graphic shifted F, graphic shifted 4''
110 PRINT AT CODE ''graphic shifted S'',X;A$(Z TO CODE
    ''graphic shifted S'')
115 IF S=X THEN GOTO 130
120 LET A$=A$(Z+Z TO)
130 LET F=F-S
135 IF H=CODE ''graphic shifted 5'' AND S<CODE ''graphic
    shifted 5'' THEN GOTO 210
140 LET H=H+(INKEY$=''6'')
150 LET S=S-(INKEY$=''5'' AND S>X)
160 IF H-CODE ''graphic shifted D'' and S<>X THEN
    GOTO 210
161 IF H>CODE ''graphic shifted D'' THEN GOTO 210
162 PRINT AT CODE ''£'',X;S;''space''
163 IF A$(Z)=''graphic 2'' THEN LET L=Z
170 IF F<=X THEN GOTO 210
180 IF A$/Z)=''inverse  *'' THEN GOTO 210
190 IF H=9 AND L=Z AND S=X THEN GOTO 250
200 GOTO 100
210 PRINT AT H,X;''3 inverse  *'';Q
250 PRINT ''WELL DONE. . . . .''
260 PRINT AT H-Z,X;''3 spaces'';TAB X;''graphic shifted
    W,graphic shifted F, graphic shifted 4''
```

Clock

Brian Buckley

When you have entered the program, press the RUN key and then the Newline key. You will be greeted with a prompt to enter the hour. Once you have done this, you will be presented with a further prompt to enter the minutes. The clock display should then ap-

▶

pear at the top centre of the screen.

Here is an example of how you would set the clock to read 12:15:

1 RUN the program
2 Press '1' followed by '2' followed by Newline
3 Press Newline (or any key except Break)

The display will now appear showing '12:00'.

4 Press Newline (or as above, any key but Break) 15 times

The display will be seen to advance by one minute after each depression of the key until it reaches 12:15.

Program description

This is how the program works, line by line. After responding to the screen prompts contained in lines 20 and 50, the clock display is printed by the PRINT statement in line 100, but only if the input for line 30 is greater than nine (10-23). If this input is less than 10 (zero to nine), then the display is printed by line 120, which places a zero in front of the hour digit.

The minutes are timed, printed and updated by the loop between lines 130 and 200. If the minutes are greater than nine, line 180 prints them after the colon which separates the hour digits from the minute digits; however, if the minutes are in the range zero to nine, then line 160 prints a zero in front of the minute digit. The PAUSE statement in line 190 controls the timing to an accuracy of greater than one second per hour. Line 210 increases the hour digit(s) by one after leaving the minutes loop after the 59th minute. When the hour (H) is greater than 23, the displayed hours will change to '00:00' because of line 220. Line 230 keeps the program running by returning control to line 80.

```
10 REM ''CLOCK''
20 PRINT AT 20,0; ''INPUT
HOUR''
30 INPUT H
40 CLS
50 PRINT AT 20,0; ''PRESS
N/L TO ADVANCE MINUTES
BY 1''
60 INPUT A$
70 IF A$ = '''' THEN CLS
80 IF H<10 THEN GOTO 120
90 IF H>10 THEN GOTO 100
100 PRINT AT 0,13; H; '':''
110 GOTO 130
120 PRINT AT 0,13; ''0''; '':''
130 FOR N=0 TO 59
140 IF N>9 THEN GOTO 180
150 IF N<9 THEN GOTO 160
160 PRINT AT 0,16; ''0''; N
170 GOTO 190
180 PRINT AT 0,16; N
190 PAUSE 2985
200 NEXT N
210 LET H=H+1
220 IF H>23 THEN LET H=0
230 GOTO 80
```

Races
Guy Jones

The idea of this game is to choose the horse you think is going to win the race out of a field of three. All you have to do to choose your horse is to input a number, either '1', '2', or '3'. After doing this, you input a suitable bet — you start off with the sum of £100.

Once you have input your bet, the race is run and you are told whether you have won or lost. Your initial money is then either decremented or incremented and you are invited to take part in another race. The game ends when you have run out of money.

```
 10  SAVE ''RACES''
 20  LET M=100
110  LET H=INT (RND * 3)+1
115  CLS
117  IF M<=0 THEN GOTO 300
120  PRINT ''RACES'';AT 2,0; ''1:NON-STARTER'';AT
     3,0;''2:ABSOLUTELY'';AT 4,0;''3:GOLDEN BOY'';AT
     6,3;''ENTER HORSE (1,2 OR 3)''
130  INPUT A
140  PRINT AT 8,0; ''ENTER YOUR BET(UP TO £'';M; '')
145  INPUT B
146  IF B>M THEN GOTO 145
147  IF A=H THEN LET B=B * 3
150  IF A=H THEN LET M=M+B
155  IF A<>H THEN LET M =M-B
160  IF A=H THEN PRINT AT 12,2;''YOU WIN''
170  IF A<>H THEN PRINT AT 12,2 ''YOU LOSE''
180  PAUSE 30
200  GOTO 110
300  PRINT ''YOU''''VE NO MONEY''
```

Currency conversion
J Howard

This is a short and simple program which will convert English sterling into four other currencies.

When you run the program, you will be greeted with some short instructions asking you to enter an amount in sterling. The program will then present you with the amounts in American dollars, Deutschmarks, Swiss francs and French francs. The figures will be held for 15 seconds while you make a note of them, the screen will clear and you will be invited to enter a new amount. If you wish the amounts to be left on the screen for longer you can always alter the PAUSE in line 80.

The amounts calculated are given in line 70 so you will have to make sure there are accurate for the day you make the calculations so that your conversions are correct.

To get the copy displayed properly on the screen, you should leave four spaces after the word 'BE' in line 20 and the word 'CONVERSION' in line 40.

```
 10  REM Currency Conversions
 20  PRINT ''ENTER STERLING AMOUNT TO BE CON-
     VERTED''
 30  GOTO 50
 40  PRINT ''THIS IS A CONTINUOUS CALCULATION PRO-
     GRAM. AFTER EACH CONVERSION ENTER A NEW
     STERLING AMOUNT''
 50  PRINT AT 10, 0; ''POUNDS'',, ''DOLLARS'',,
     ''D.MKS'',, ''SW. FCS'',, ''F.FCS''
 60  INPUT P
 70  PRINT AT 10, 16; P,, P * 1.54,, P * 3.91,, P * 3.22,,
     P * 11.75
 80  PAUSE 750
 90  CLS
100  GOTO 40
```

Pedestrian
Martin Bradburn

This is a fast action game for the unexpanded ZX81.

Your mission is to guide your pedestrian across a busy road, dodging all the vehicles which obstruct your way. You must use the '5' and '8' keys to move backwards and forwards respectively.

The 'A' in line 4 and line 10, and the 'D' in line 6, should be entered in Graphics mode.

```
 1  LET A=VAL ''10''
 2  LET B=CODE '' ''
 3  LET S=B
 4  PRINT AT CODE ''<'',INT (RND * 30):''A''
 5  SCROLL
 6  PRINT AT A,B;''D''
 7  PRINT AT A,B;'' ''
 8  IF B=VAL ''30'' THEN GOTO 12
 9  LET B=B+(INKEY$=''8'')-(INKEY$=''5'')
10  IF PEEK (PEEK 16398+256*PEEK 16399)=CODE ''A''
    THEN LET S=S+1
11  GOTO VAL ''4''
12  PRINT ''YOU GOT RUN OVER '';S;'' TIMES''
13  PAUSE VAL ''200''
14  CLS
15  RUN
```

Tower attack
Gregory Briggs

You control a tank which is situated to the west of the enemy's aircraft control tower. You must judge the amount of gunpowder required to project the shell to the tower and thus destroy it.

In line 10 you will need to enter a Graphic shifted '7', line 25 contains a Graphic shifted 'P', line 30 includes a Graphic space and a Graphic shifted '7', and lastly, line 80 contains a space and a full-stop within the double guotes.

```
  1 REM ''ATTACK''
  2 CLS
  3 LET L=1
  4 LET S=INT (RND * 11)+17
  5 FOR F=1 TO 30
 10 PRINT AT +0,F;''▀''
 20 NEXT F
 25 PRINT AT 19,8;''▨''
 30 PRINT AT 19,L;''■▀  ''
 40 PRINT AT 0,0;''ENTER AMOUNT OF GUN POWDER(1
    TO 28)''
 50 INPUT C
 60 FOR R=1 TO C
 70 LET L=L+1
 80 PRINT AT 18,L;'' .''
 90 NEXT R
 95 IF C<>S-2 THEN GOTO 200
100 PRINT AT 12,6;''■TOWER DEMOLISHED ■''; AT
    19,L+1;'' ''
101 PRINT AT 14,5;''ANOTHER ROUND(Y/N)''
102 INPUT A$
103 IF A$=''Y'' THEN GOTO 2
104 STOP
200 PRINT AT 12,8;''■ YOU MISSED■ ''
210 GOTO 101
```

U-boat
Neil Stevens

U-boat is a 1K ZX81 game, written partly in machine code to speed up the game and save memory. The machine code's role in the listing is to print the initial screen, scroll the top line and to re-print a boat on the top line.

You should first enter the machine code loader shown in Fig. 1. After running the program, you should delete lines 10-70 and enter the main program shown in Fig. 3. When run, the line 0 should contain all the machine code. The machine code has been shown in more detail in Fig. 2.

The program displays an enemy vessel chugging merrily away across the top of the screen. You are positioned in your submarine at the bottom of the screen. To destroy the enemy craft, you must press any key (except for the Space key or the Shift key) to launch your torpedoes.

Fig. 1.

```
  1 REM 62 characters
 10 LET A$=''3E00061DD710FD3E81D73E83D73E00D7
    3E0806A0D710FD3E800620D710FDC92A0C40545D2
    32313011F00EDB0C92A0C40061D23360010FB23368
    1233683C9''
 20 POKE 16510,0
 30 LET X=16514
 40 POKE X,16 * CODE A$+CODE A$(2)-476
 50 LET X=X+1
 60 LET A$=A$(3 TO)
 70 GOTO 40
```

Fig. 2.

Print screen:

```
3E 00       ld A,0 print top line
06 1D       ld B,29
D7          Rst 10
10 FD       Djnz -3
3E 81       ld a, 129 Print boat
D7          Rst 10
3E 83       ld a, 131
D7          Rst 10
3E 00       ld a, 0
D7          Rst 10
3E 08       ld a, 8 Print sea
06 A0       ld b, 160
D7          Rst 10
10 FD       Djnz-3
3E 80       ld a, 128 Print Seabed
06 20       ld b, 32
D7          Rst 10
10 FD       Djnz -3
C9          Ret
```

Top line scroll:

```
2A 0C 40    ld HL, (D-FILE)
54          ld D,H
5D          ld E,L
23          Inc HL
23          Inc HL
13          Inc DE
01 1F 00    ld BC,31
ED B0       Ldir Blockload line
C9          Ret
```

Re-print the boat:

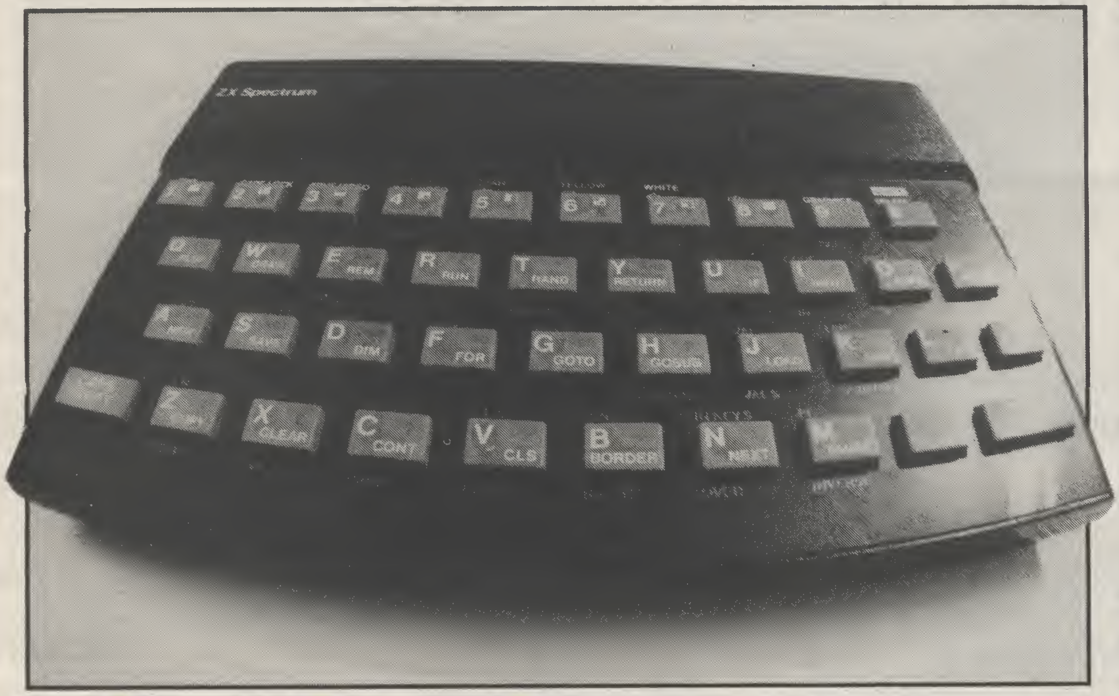
```
2A 0C 40    ld HL (D-FILE)
06 1D       ld B, 29
23          Inc HL
36 00       ld (HL),0
10 FB       Djnz -5
23          Inc HL
36 81       ld (HL),129
23          Inc HL
36 83       ld (HL),131
C9          Ret
```

Fig. 3.

```
  0 REM (machine code)
 10 LET S=NOT PI
 20 LET L=USR 16514
 30 LET A=INT(RND * 30)
 40 PRINT AT 5,A;''graphic S; l;graphic S''
 60 FOR F=28 TO -2 STEP -1
 70 IF INKEY$<>'''' THEN GOTO 200
 80 LET L=USR 16545
100 NEXT F
110 LET S=S-1
120 PRINT AT PI * PI,NOT PI;S;''space''
130 LET L=USR 16559
135 PRINT AT VAL''5'',A;''3 graphic A''
140 GOTO VAL''30''
200 FOR O=VAL''4'' TO PI/PI STEP -1
210 PRINT AT 0,A+1;'' * '';AT 0,A+1:''graphic A''
220 NEXT O
225 LET S=S-2
250 IF A=F OR A=F+1 THEN LET S=S+6
260 PRINTAT PI*PI,NOT PI;S;''space
270 GOTO VAL ''80''
```

Structured Programming

Sketching an outline, an approach to structured programming on the Spectrum by Tim Hartnell.



Many times I've written articles, and chapters in books, which are supposedly going to improve the programming skill of those whose read them. But every time I produce such a list of 'things you really should be doing when you program', or explain the same material to someone, I am reminded of an old story about a farmer.

He was approached by a young man selling correspondence courses in 'Effective Farming'. "Don't you see," the young salesman said as part of his pitch, "that if you take this course, you'll know so much more about farming?". The farmer replied. "I don't even farm now as good as I know how."

So it goes, I suggest, for advice on programming. I know full well that I do not 'programme as good as I know how'. Many times I break all the rules, wading straight into coding a complex program without even a thought for the dictates and structures of 'structured programming'.

So I suggest you keep in mind, when reading this article, that I do not really believe that you — or anyone else — is really going to take them as final gospel from the great master — rules which must be obeyed if your mortal soul is not going to be put into dire peril. The best way to approach this — and any other material in a similar vien which you come across — is to read it carefully, and make your own assessment on each suggestion given. Then, just apply the things which seem OK to you.

Basically...

The basic idea I'd like to outline in this article is that of approaching structured programming with the idea of 'sketching an outline'.

The idea is simple, but very valuable in order to help you write complicated and involved programs. Of course, you may well be already creating very complex programs without using anything like the idea I'm about to outline. Even if you are, I suggest you think carefully about these ideas, so that you can see that they may make your job easier.

The fundamental idea of structured programming lies hidden in the phrase 'top down programming'. This suggests that you start the process of programming by first stating in words the broad aim of the program you are about to write. You follow this up by writing a series of notes — each of which will eventually be a subroutine — which cover each of the main tasks which the computer will carry out.

To clarify this last paragraph, I'll give you a concrete example. Here are the steps you could follow when trying to write a 'Noughts and Crosses' program. (I must point out that 'structured programming' produces listings which are much longer than might otherwise be the case. However, this greater length is more than offset by the fact that programs built up in this way are very simple to debug and improve, and their structure can be readily understood by other programmers — a claim which you are unlikely to be able to make with confidence about some of your current programs.)

```
SET UP INITIAL BOARD
COMPUTER MOVE
(a)   CHECK IF MIDDLE
      SQUARE IS EMPTY, IF
      NOT, MOVE HERE
(b)   CHECK IF THERE IS A
      COMPUTER WINNING
      MOVE, IF SO MAKE IT
(c)   CHECK IF HUMAN WILL
      WIN ON NEXT MOVE, IF
      SO BLOCK
(d)   IF NO MOVE MADE,
      CHECK TO SEE IF A
      RANDOM MOVE CAN
      BE MADE, IF SO MAKE
      IT, IF NOT DECLARE A
      DRAW
PRINT BOARD
ACCEPT PLAYER MOVE
PRINT BOARD
CHECK IS PLAYER HAS WON,
IF SO STOP
GOTO 'COMPUTER MOVE'
```

As you'll see if you take a few moments to study this sketched outline, the outline tells you exactly which steps the computer will follow, the decisions it will be called to make, and the alternative results of those decisions.

You have already completed the first step towards writing a 'Noughts and Crosses' program. You'll see, by the way, that it doesn't matter at all if you do not yet know *how* you are going to get your Spectrum to carry out the necessary steps — all that matters is that you have some awareness that the steps must, in some fashion, be executed in due course.

Secondly...

The second step of the process consists of turning the sketched outline into a series of subroutine calls. In languages which are more structured than Spectrum BASIC (such as BBC BASIC, or Pascal, which the BBC BASIC designers obviously used for inspiration), it is relatively easy to call a number of subroutines within an endless loop with a structure like DO/WHILE or REPEAT/UNTIL. These allow you to repeat a series of program steps indefinitely until a certain condition is satisfied, or the state of pointer or flag changes.

In Spectrum BASIC, we have to be content with the humble, and much-maligned, GOTO. Much of the reaction against GOTO, which many 'serious programmers' see as the greatest insult to the art of true programming ever developed, came from early and relatively primitive versions of BASIC, in which you could only follow an IF/THEN with a GOTO. This meant the program leapt all over the place, leading to 'spaghetti code' which was horrendously difficult to interpret. (The BASIC supplied with the standard TI 99/4A only supports a GOTO after an IF/THEN producing some extraordinarily convoluted programs, as you'll see if you look in books of TI programs).

Now, of course, we can do almost anything after an IF/THEN (including such things as LISTing). Old habits die hard, however, so the judgemental flavour of the pronouncements against GOTO are sure to continue. This should not bother us, as we are programming to produce programs which run well, and are clearly structured, and GOTOs do not necessarily interfere with those aims.

Anyway, to get back to the second stage of our introduction to structured programming. We can convert the sketch outline given before into a series of subroutine calls, endlessly cycled by a GOTO, as follows:

```
10 REM NOUGHTS AND CROSSES
20 GOSUB 9000:REM INITIALISE
30 GOSUB 1000:REM COMPUTER MOVE
40 GOSUB 8000:REM PRINT BOARD
50 GOSUB 2000:REM ACCEPT PLAYER MOVE
60 GOSUB 8000:REM PRINT BOARD
70 IF HUMAN HAS NOT WON AND COMPUTER HAS NOT WON THEN GO TO 30
80 PRINT CONGRATULATIONS OR OTHER MESSAGE
```

Now, as you can see, we have the 'framework' for a workable 'Noughts and Crosses' program, even though we do not yet have a clue how the program will actually work. We can now set about writing the program from first principles.

There are two further advantages of this outline approach. If there is something we cannot, at this stage, actually program (like the basis upon which the computer finds out who has won) we can simply put in a PRINT statement within the subroutine like PRINT ''CHECKING FOR WIN'' and continue to use the program, as we work on it. Then, each time the computer should be checking for a win, it will print up 'CHECKING FOR A WIN'. This means that you can continue working a minor subroutine section which you cannot, for the moment, solve.

The second advantage comes towards the end of the program development stage, the debugging stage. I always find this the most frustrating, and in many ways, the least rewarding aspect of programming. Although I can get a program working reasonably well fairly quickly (although my first Chess in BASIC took nearly six months), to get the program from 'working reasonably well' to 'performing without faults under all conditions' can take as long as it took to get the first version even working at all. However, when you set up the program in the way described in the article, you'll see that the debugging stage can be considerably simplified.

You may find, for example, in your 'Noughts and Crosses' program, that the computer tends to ignore the bottom right-hand corner, when a move into this position would enable it to win, or to block a win from the human. From the 'subroutine loop' we set up before, we know the computer's move must be made somewhere between lines 1000 and 1999. This immediately narrows down the search. If you have been clever, and have made each subroutine a series of further subroutines, each constructed in a similar way to our major subroutine, it would be even easier to track down the bug.

Difficult?

Let's look at this idea — making each subroutine a series of further subroutines — a little more closely. We'll look at the subroutine starting at line 1000, the one in which the computer actually makes it move, as this is most important (and difficult to program) of all those in this program.

The subroutine could begin as follows:

```
2000 REM COMPUTER MOVE
2010 LET MOVE=0:REM IF THIS BECOMES 1 A VALID MOVE HAS BEEN FOUND
2020 GOSUB 2200:REM CHECK IF MIDDLE SQUARE EMPTY
2030 IF MOVE=1 THEN RETURN
2040 GOSUB 2400:REM CHECK IF A POSSIBLE WINNING MOVE EXISTS
2050 IF MOVE=1 THEN RETURN
2060 GOSUB 2600:REM CHECK IF A POSSIBLE HUMAN WIN CAN BE BLOCKED
2070 IF MOVE= 1 THEN RETURN
2080 GOSUB 2800:REM CHECK IF ANY MOVE AT ALL CAN BE MADE
2090 IF MOVE=1 THEN RETURN
2100 REM A RETURN WITH MOVE=0 MEANS NO FURTHER MOVES POSSIBLE
2110 RETURN
```

As I said earlier, programs constructed using the 'endless loop of subroutines' coupled with 'subroutines within subroutines' makes listings which may be far longer than usual. However, there is usually little need to worry about running out of memory on the Spectrum (unlike the 1K ZX81, when counting bytes became the dominant feature of our programming lives). Therefore, the longer listings will be amply repaid by the extra clarity your programs attain, and the much shorter time it will take to produce a debugged masterpiece of which you can be proud.

Finally...

Finally, I'd like to give you a few more 'sketched outlines' which you may wish to try and turn into complete programs. Once you've done this, you'll have a much better idea of how the whole process works.

First we'll look at John Conway's famous Life program, which imitates the life, birth and death of a colony of cells. The sketched outline could be as simple as:

```
INITIALISE
PRINTOUT COLONY
UPDATE COLONY
GOTO PRINTOUT
```

This might be seen as cheating, as it gives little clue as to how the program can be implemented. However, assuming you knew the rules (which are given in a moment) you could produce a perfectly adequate program, starting with a simple routine like this. (The rules, so you can work out your own Life program, assume that the cells are on a grid, and the future state of each cell is determined by reference to the eight cells surrounding each cell on the grid. If the cell at the centre of the eight is empty, and there are exactly three cells occupying surrounding positions, a new cell is born in that position the next time the colony is printed. If there are four cells in the surrounding squares, and the position being used for reference contains a cell, that cell dies in the next generation. If the position being checked contains a cell, but the surrounding positions are all empty, the cell dies in the next generation. If there are two cells in the grid positions around that being checked, the centre position remains unchanged.)

Now, we'll look at a sketched outline of a 'Breakout' type game, which you can use as a framework for building your own program:

```
INITIALISE
PRINT BAT, BALL, BRICKS
MOVE BAT
MOVE BALL (BOUNCE IF NECESSARY)
IF BALL HAS HIT BRICK, REMOVE BRICK, UPDATE SCORE
IF BALL IS IN LINE WITH THE BAT, CHECK TO SEE IF BAT WILL DEFLECT IT; IF SO GO TO 'PRINT BAT, BALL, BRICKS'; IF NOT GO TO 'REDUCE BALL TOTAL' SUBROUTINE
IF NUMBER OF BALLS IS GREATER THAN ZERO THEN GOTO 'PRINT BAT, BALL, BRICKS'.
```

You'll find that if you start like this, the whole process of constructing a major progam is much, much simpler than might otherwise be the case. You'll also find that the time involved will be much more constructively spent than it would have been if you'd just waded into the programming without taking the time to sketch your outline first.

Ignore the young salesman, and try now 'to program as good as you know how'.

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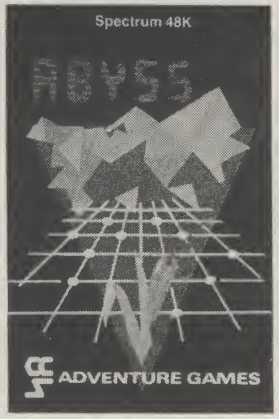

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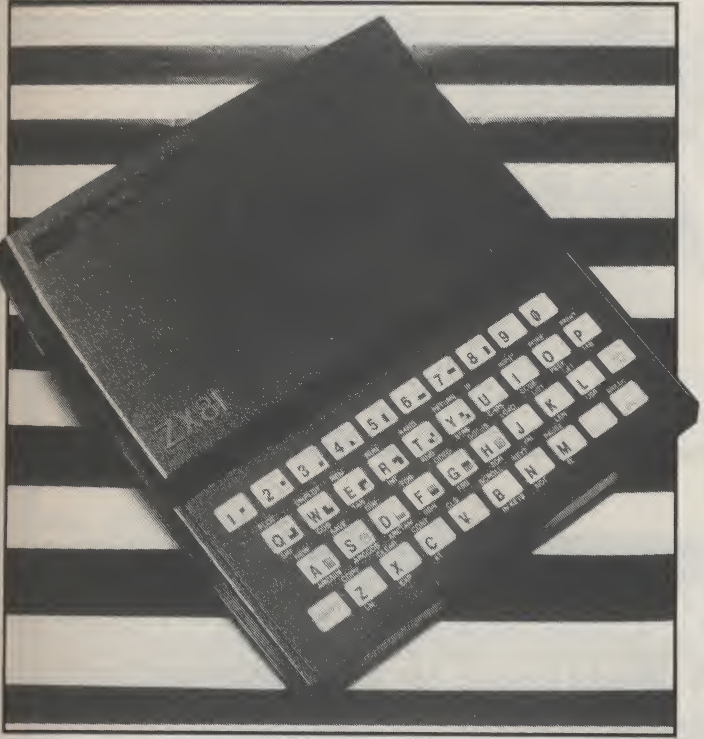

In this game you play the part of a burglar who has decided to burgle the safe from the Arich household. You are represented by the 'O' character and you move about the room using the cursor keys on the ZX81.

Your accomplice in this mission has been inside the room and has provided you with an idea of what to expect in the room, including the fact that the safe is surrounded by pressure pads. Your accomplice has even managed to deactivate some of the pads, but has neglected to tell you which ones – good accomplices are so hard to find these days!

To get to the safe you must move carefully around the chairs and tables in the room, so as to keep the noise down. Then, you must make your way to the safe, keeping clear of the alarm pads if possible. You must then land on the '/' symbol beneath the safe to steal the loot.

You'll have to hurry though, as the watchman checks this room every now and then and you wouldn't want to get caught would you?

Line by line

Here follows a brief look at the program which should help you understand the listing a little better:

Lines 10-45	Print the instructions.
Lines 49-75	Set up the variables.
Lines 90-140	Move your character about the house.
Lines 150-190	See if your character is caught or has reached the safe.
Lines 200-999	Set up the alarm pads.
Lines 1000-1030	Set up the house display.
Lines 1500-1595	Tell you that your character has been caught.
Lines 2000-9999	Tell you that your character has reached the safe.

Variables

Here is a list of the main variables used throughout the program:

B$ = INKEY$.
A$ = The burglar.
X = The burglar's X co-ordinate (vertical).
Y = The burglar's Y co-ordinate (horizontal).
N = Time in the house before the watchman comes round.
A = Variable for a house position.
S = Used in setting up the alarm pads.
T = Used in setting up the alarm pads.
M = Used in setting up the alarm pads.
Z$ = The house plan.

```
  10 REM BURGLARS BY ANDREW BRYD
ON
  15 REM PRINTS INSTRUCTIONS
  20 PRINT AT 0,11;"BURGLARS"
  30 PRINT AT 2,0;"YOU ARE A BUR
GLAR,AND  YOU HAVE TO TRY TO STE
AL FROM A SAFE IN ARICH HOUSEHOL
D.";"";
  31 PRINT "THERE  WILL  BE  TAB
LES AND CHAIRS IN THE ROOM.";"";
  32 PRINT "  ALSO,UNDER THE CAR
PET ARE SOME  BURGLAR ALARM PADS
 (""*"").LUCKILYYOUR ACCOMPLICE
IN THE HOUSE WASABLE  TO LOCATE
AND DEACTIVATE  SOME,BUT NOT ALL
,OF THE PADS."
  33 PRINT "YOU ARE SHOWN AS ""O
"""
  34 PRINT "TO TAKE THE LOOT YOU
 MUST LAND  ON THE ""/"" BELOW T
HE SAFE"
  35 PRINT "YOU HAVE A SET TIME
BEFORE  THE WATCHMAN COMES ROUND
"
  36 PRINT "             GOOD STEALI
NG"
  40 PAUSE 1000
  45 CLS
  49 REM SET UP VARIABLES
  50 LET B$=INKEY$
  59 DIM A(20,29)
  60 GOSUB 1000
  61 GOTO 200
  66 LET A$="O"
  67 LET X=9
  68 LET Y=3
  70 FOR N=1 TO 91
  75 PRINT AT X,Y;A$
  90 REM MOVES BURGLAR AROUND RO
OM
 100 PRINT AT 20,0;"TO MOVE BURG
LAR TYPE 5 FOR LEFT,8 FOR RIGHT,
7 FOR UP,6 FOR DOWN."
 115 PRINT AT X,Y;" "
 116 LET B$=INKEY$
 120 LET X=X-(B$="7")+(B$="6")
 130 LET Y=Y-(B$="5")+(B$="8")
 140 PRINT AT X,Y;A$
 150 REM LOOKS TO SEE IF BURGLAR
 IS CAUGHT OR HAS NABBED THE LOO
T
 155 IF X=4 AND Y=26 THEN GOTO 2
000
 160 IF X=4 AND Y=24 OR X=6 AND
Y=25 OR X=6 AND Y=28 THEN GOTO 1
500
 170 IF A(X,Y)=7 THEN GOTO 1500
 180 NEXT N
```

▶

```
 190 GOTO 1500
 200 REM SETS UP ALARM PROB
 201 FAST
 202 FOR S=2 TO 17
 210 FOR T=4 TO 24
 220 LET M=INT (RND*10+1)
 230 IF M>7 THEN PRINT AT S,T;"*
"
 240 IF M>9 THEN LET A(S,T)=7
 250 NEXT T
 260 NEXT S
 261 PRINT AT 9,9;"▒▀  █ ▒";AT 1
0,9;"▒   █";AT 11,9;"▄▄";AT 12,1
4;"▒"
 262 SLOW
 270 GOTO 66
 999 STOP
1000 REM SET UP PLAN OF HOUSE
1010 LET Z$="----WINDOWS--------
----------   {   ▒▒▒▒▒▒      ▒▒▒
▒▒▒  THES)   )
      ▒▒A{   {
      ▒▒F)   )
    * / E{   {
    *    )   )▒
     *** {   {▒
         )   )▒
       ' {   {▒      ▒▒  █ ▒
       :▒)   )▒      ▒   █
     ./ ▒{   {       ▒▒
        ▒)   )            ▒
        ▒{   {
        ▒)   )
         {   {
         )   )
         {   {
         )   )     ▒▒▒▒▒   ▀▀▀▀
         {   -------------DOOR-
----------"
1020 PRINT AT 0,1;Z$
1025 PRINT AT 6,28;"*"
1030 RETURN
1500 REM INFORMING THE PLAYER HE
 HAS BEEN CAUGHT
1505 CLS
1510 PRINT "        YOU HAVE"
1520 PRINT "        BEEN CAUGHT"
1530 PRINT "        AND GIVEN"
1540 PRINT "        A LIFE"
1550 PRINT "       SENTENCE"
1555 PAUSE 100
1560 PRINT ,,"ANOTHER GO?    (Y/N
)"
1570 INPUT B$
1580 IF B$<>"Y" AND B$<>"N" THEN
 GOTO 1570
1585 IF B$="N" THEN STOP
1590 IF B$="Y" THEN CLS
1595 IF B$="Y" THEN GOTO 49
2000 REM INFORMING THE PLAYER HE
 HAS NABBED THE LOOT
2005 CLS
2010 PRINT "       YOU HAVE"
2020 PRINT "       STOLEN"
2030 PRINT "       THE CASH"
2040 PAUSE 50
2052 PRINT AT 10,10;"CONGRATULAT
IONS"
2053 PAUSE 50
2054 PRINT AT 18,0;"ANOTHER GO?
 (Y/N)"
2055 INPUT B$
2060 IF B$<>"Y" AND B$<>"N" THEN
 GOTO 2055
2065 IF B$="N" THEN STOP
2070 IF B$="Y" THEN CLS
2075 IF B$="Y" THEN GOTO 49
9999 STOP
```

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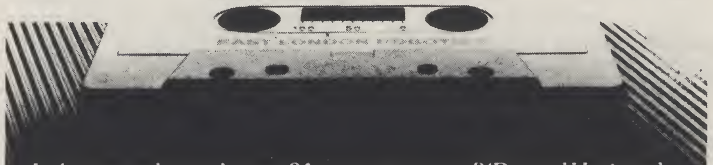

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EAST LONDON ROBOTICS

Sales report

A user-friendly sales records program for your Spectrum written by David Rands of Harlington.

Sales Report is a menu driven program which was written to keep records of individual sales results on a weekly basis over the period of a year.

The main features available are:

1. Record of weekly results for each employee during each month.
2. Summary of individual results by month.
3. Summary of individual results by year to date.

A total of 12 employees (or departments, areas, shops, etc) are provided for and there is also provision for adding or deleting these during the year. If all 12 addresses are in use and an employee leaves, a new name can be entered in the ex-employee's position. In this event the results of the ex-employee are automatically transferred to a separate store and are reproduced in the monthly and year to date summaries.

Entries are made at the end of each week and also on the last day of the month, so that five weeks' entries are provided for within each month.

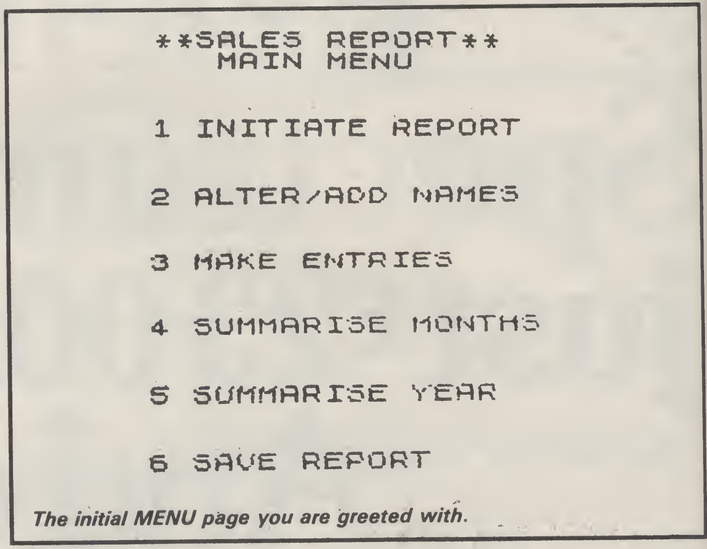
The program has been designed to be 'user friendly' and considerable use has been made of error trapping routines.

If it is desired to interupt the program during a run, it is important to continue by entering 'GOTO 400' which will ensure that the arrays are protected.

Variables

Here follows a list of the main variables used throughout the program:

m and n	Used in loops.
W	Week's balance, three dimensional array (employee, month and week).
T	Month's totals, two dimensional array (employee and month).
V	Month's totals for ex-employees, two dimensional array (employee and month).
P	Monthly total for all employees.
Q	Monthly total for all ex-employees.
X	Annual total for all employees.
U	Annual total for all ex-employees.
Z	Temporary monthly total used in addition calculation.
C,D,F	Used in INPUT statements (C = employee, D = month and F = week.
B$	Months of the year.
S$	Employees' names.
L$	Stores a line.
q$	Used in various INPUT statements.



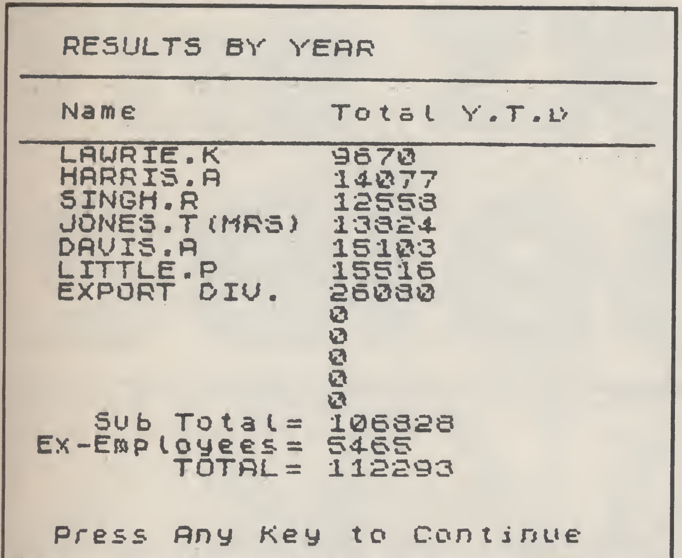
```
**SALES REPORT**
  MAIN MENU

1 INITIATE REPORT

2 ALTER/ADD NAMES

3 MAKE ENTRIES

4 SUMMARISE MONTHS

5 SUMMARISE YEAR

6 SAVE REPORT
```

The initial MENU page you are greeted with.

Program description

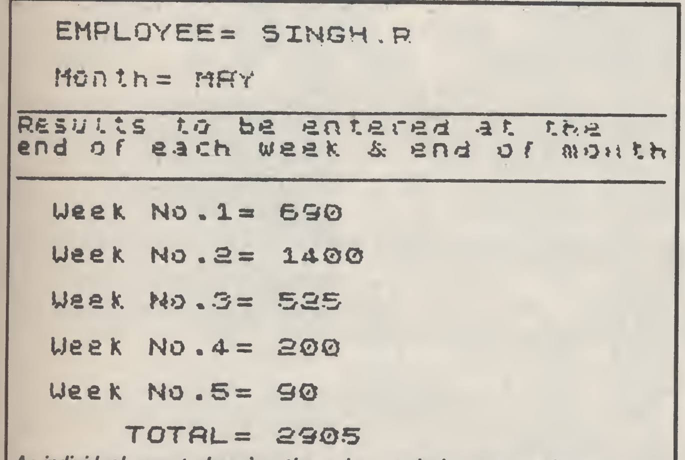
A line by line breakdown of the program follows:

Lines 5-70	Set up the months of the year.
Lines 100-250	Dimension the main arrays. Let the user set up the names of the employees.
Lines 260-350	Enable user to correct any errors in the initial set up of the names of the employees.
Lines 400-545	Main menu and choice routine.
Lines 550-595	Protect the main arrays with a question routine.
Lines 600-700	Enable the user to delete an existing name or add a name at a previously unused address.
Lines 710-730	Transfer the monthly balance of ex-employees sales to a new array.
Lines 740-780	Delete ex-employee's sales from a previous address position.
Lines 800-910	Enable the user to choose employee and month to commence entries.
Lines 920-1050	Display the month, name and any balances against particular week number.
Lines 1060-1100	Enable the user to choose week number against which entries are to be made.
Line 1110	If the user chooses a week where there is already a balance, the program jumps to line 1150.
Lines 1120-1140	Allow the user to make an entry.
Lines 1150-1180	Allow the user to have the option of deleting the balance or returning to the MENU.
Lines 1190-1240	Balance is deleted and the display is cleared and reprinted. Program returns to INPUT statement.
Lines 1300-1340	The user chooses month to be summarised.
Lines 1350-1410	The results of current employees are displayed.
Lines 1420-1480	The results of ex-employees are displayed.
Lines 1490-1520	The user has the option of summarising other months or returning to the MENU.
Lines 1550-1590	The heading for the annual summary is displayed.
Lines 1600-1670	Calculate the year to date total for employees and ex-employees.
Line 1660	When the first employee's results are calculated, this line initiates a GO SUB routine.
Lines 1710-1760	(GO SUB routine) Print results of each employee as they are calculated. When all results are known it then calculates and displays the year to date result of current employees, ex-employees and the grand total.
Lines 1800-1850	SAVE and VERIFY routine. Loads program and variables, and will run automatically from line 400.



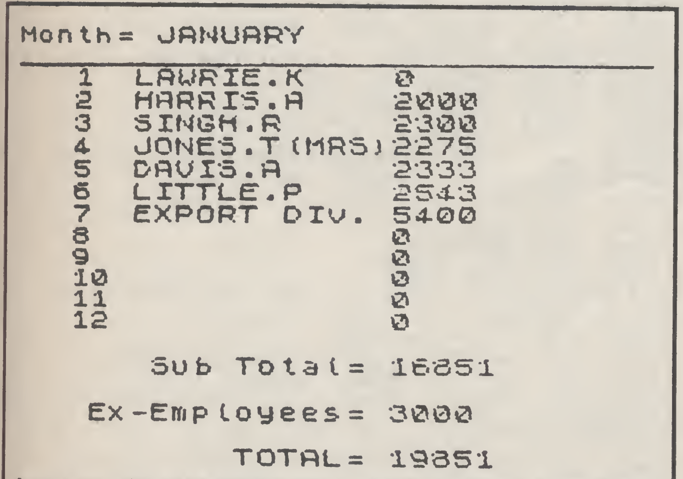
```
  RESULTS BY YEAR

  Name             Total Y.T.D

  LAWRIE.K         9670
  HARRIS.A         14077
  SINGH.R          12553
  JONES.T(MRS)     13824
  DAVIS.A          15103
  LITTLE.P         15516
  EXPORT DIV.      26080
                   0
                   0
                   0
                   0
                   0
     Sub Total=    106828
  Ex-Employees=    5465
        TOTAL=     112293

  Press Any Key to Continue
```

The results of the various salespeople throughout the year, complete with the total sales for the year.



```
  EMPLOYEE= SINGH.R

  Month= MAY

Results to be entered at the
end of each week & end of month

  Week No.1= 690

  Week No.2= 1400

  Week No.3= 525

  Week No.4= 200

  Week No.5= 90

     TOTAL= 2905
```

An individual report showing the sales made by one particular salesperson over a specified period.



```
Month= JANUARY

   1  LAWRIE.K       0
   2  HARRIS.A       2000
   3  SINGH.R        2300
   4  JONES.T(MRS)   2275
   5  DAVIS.A        2333
   6  LITTLE.P       2543
   7  EXPORT DIV.    5400
   8                 0
   9                 0
  10                 0
  11                 0
  12                 0

       Sub Total=    16851

    Ex-Employees=    3000

           TOTAL=    19851
```

A page showing each salesperson's record throughout a particular month.

```
   5 REM ***SALES REPORT***
  10 DIM B$(12,9): REM MONTHS
  20 FOR n=1 TO 12
  30 READ B$(n)
  40 NEXT n
  50 DATA "JANUARY","FEBRUARY","
MARCH","APRIL","MAY","JUNE","JUL
Y","AUGUST","SEPTEMBER","OCTOBER
","NOVEMBER","DECEMBER"
  60 LET L$="_____________________
"________________
  70 GO TO 400
 100 REM **INITIATE REPORT**
 110 CLS
 120 PRINT AT 0,3;"ENTER NAMES O
F EMPLOYEES";AT 1,6;"(maximum 12
)"
 130 PRINT L$
 140 DIM S$(12,12): REM NAMES
 150 DIM W(12,12,5): REM WEEKS B
ALANCES
 160 DIM T(12,12): REM TOTALS
 170 DIM V(12,12): REM EX-EMPLOY
EES
 180 LET m=1
 190 INPUT "Enter name of Salesp
erson","(max 12 letters & spaces
) ";S$(m)
 200 PRINT TAB 3;m;TAB 6;S$(m)
 210 LET m=m+1: IF m>12 THEN GO
TO 260
 220 INPUT "Anymore Entries? y/n
";q$
 230 IF CODE q$=78 OR CODE q$=11
0 THEN GO TO 260
 240 IF CODE q$<>89 AND CODE q$<
>121 THEN GO TO 220
 250 GO TO 190
 260 INPUT "Are Entries Correct?
y/n ";q$
 270 IF CODE q$=89 OR CODE q$=12
1 THEN GO TO 400
 280 IF CODE q$<>78 AND CODE q$<
>110 THEN GO TO 260
 290 INPUT "Enter Number for Emp
loyee","to be changed ";R
 300 INPUT "Enter name of Salesp
erson","(max 12 letters & spaces
) ";S$(R)
 310 CLS
 320 FOR n=1 TO m-1
 330 PRINT TAB 3;n;TAB 6;S$(n)
 340 NEXT n
 350 GO TO 260
 400 REM **MAIN MENU**
 410 BORDER 6
 420 CLS : PRINT AT 0,6;"**SALES
 REPORT**";AT 1,9;"MAIN MENU"
 430 PRINT AT 4,6;"1 INITIATE RE
PORT"
 440 PRINT AT 7,6;"2 ALTER/ADD N
AMES"
 450 PRINT AT 10,6;"3 MAKE ENTRI
ES"
 460 PRINT AT 13,6;"4 SUMMARISE
MONTHS"
 470 PRINT AT 16,6;"5 SUMMARISE
YEAR"
 480 PRINT AT 19,6;"6 SAVE REPOR
T"
 490 INPUT FLASH 1;"ENTER CHOICE
 1 to 6 ";C
 500 IF C<1 OR C>6 THEN GO TO 49
0
 510 CLS
 520 IF C=1 THEN GO TO 550
 525 IF C=2 THEN GO TO 600
 530 IF C=3 THEN GO TO 800
 535 IF C=4 THEN GO TO 1300
 540 IF C=5 THEN GO TO 1550
 545 IF C=6 THEN GO TO 1800
 550 REM **PROTECT ARRAYS**
 560 PRINT AT 8,1; INK 1;"By ent
ering (1) on MENU you";AT 9,1;"w
ill clear all existing records";
AT 12,5;"IS THIS CORRECT?";AT 14
,5;"Enter 'y' to proceed";AT 16,
5;"Enter 'n' for MENU"
 570 INPUT q$
 580 IF CODE q$=78 OR CODE q$=11
0 THEN GO TO 400
 590 IF CODE q$<>89 AND CODE q$<
```

▶

```
>121 THEN GO TO 570
 595 GO TO 100
 600 REM **ALTER/ADD NAMES**
 610 PRINT AT 0,3;"SALES STAFF"
 620 PRINT L$
 630 FOR n=1 TO 12
 640 PRINT TAB 3;n;TAB 6;S$(n)
 650 NEXT n
 660 PRINT AT 16,2; INK 1;"To AL
TER or ADD names enter";AT 17,8;
"EMPLOYEE number";AT 19,2;"To re
turn to MENU press ENTER"
 670 INPUT Z$
 680 IF Z$="" THEN GO TO 400
 690 LET R=VAL Z$
 700 INPUT "Enter name of Salesp
erson","(max 12 letters & spaces
) ";S$(R)
 710 FOR m=1 TO 12
 720 LET V(R,m)=T(R,m)
 730 NEXT m
 740 FOR m=1 TO 12
 750 FOR n=1 TO 5
 760 LET W(R,m,n)=0: LET T(R,m)=
0
 770 NEXT n: NEXT m
 780 CLS : GO TO 610
 800 REM **MAKE ENTRIES**
 810 PRINT AT 0,3;"SALES STAFF"
 820 PRINT L$
 830 FOR n=1 TO 12
 840 PRINT TAB 3;n;TAB 6;S$(n)
 850 NEXT n
 860 PRINT AT 21,2; FLASH 1; INK
 1;"Enter Choice 1 to 12"
 870 INPUT C
 880 IF C<1 OR C>12 THEN GO TO 8
70
 890 CLS
 900 INPUT "Enter Month as a Num
ber ";D
 910 IF D<1 OR D>12 THEN GO TO 9
00
 920 PRINT AT 0,3;"EMPLOYEE= ";S
$(C)
 930 PRINT AT 2,3;"Month= ";B$(D
)
 940 PRINT L$
 950 PRINT AT 4,1;"Results to be
 entered at the";AT 5,1;"end of
each week & end of month"
 960 PRINT L$: PRINT
 970 LET m=1
 980 FOR n=8 TO 16 STEP 2
 990 PRINT AT n,3;"Week No.";m;"
= "; INK 2;W(C,D,m)
1000 LET m=m+1: NEXT n
1010 LET T(C,D)=0
1020 FOR n=1 TO 5
1030 LET T(C,D)=W(C,D,n)+T(C,D)
1040 NEXT n
1050 PRINT AT 18,7;"TOTAL= "; IN
K 2; BRIGHT 1;T(C,D)
1060 INPUT "Any Entries? y/n ";q
$
1070 IF CODE q$=78 OR CODE q$=11
0 THEN GO TO 400
1080 IF CODE q$<>89 AND CODE q$<
>121 THEN GO TO 1060
1090 INPUT "Enter Week Number ";
F
1100 IF F<1 OR F>5 THEN GO TO 10
90
1110 IF W(C,D,F)>0 THEN GO TO 11
50
1120 INPUT "Enter Results"'"(rou
nded up to the nearest £) ";W(C,
D,F)
1130 BEEP .15,20
1140 GO TO 970
1150 PRINT AT 19,1; INK 1;"There
 is already a balance on";AT 20,
1;"WEEK ";F;" Enter '0' to clear
 ";AT 21,1;" balance.Press ENTER
 for MENU"
1160 INPUT Z$
1170 IF Z$="" THEN GO TO 400
1180 IF CODE Z$<>48 THEN GO TO 1
240
1190 LET W(C,D,F)=0
1200 FOR m=8 TO 18 STEP 2
1210 FOR n=19 TO 21
1220 PRINT AT m,14;"
   ": REM 16 SPACES
1230 PRINT AT n,0;"
                    ": REM 31 SPA
CES
1240 NEXT n: NEXT m: GO TO 970
1300 REM **SUMMARISE MONTHS**
1310 LET P=0
1320 CLS : PRINT AT 0,2;"RESULTS
 BY MONTH"
1330 INPUT "Enter Month as a Num
ber ";D
1340 IF D<1 OR D>12 THEN GO TO 1
330
1350 PRINT '"Month= ";B$(D)
1360 PRINT L$
1370 FOR n=1 TO 12
1380 PRINT TAB 3;n;TAB 6;S$(n);T
AB 18; INK 2;T(n,D)
1390 LET P=P+T(n,D)
1400 NEXT n
1410 PRINT 'TAB 7;"Sub Total= ";
 INK 2;P
1420 LET Q=0
1430 FOR n=1 TO 12
1440 LET Q=Q+V(n,D)
1450 NEXT n
1460 PRINT 'TAB 4;"Ex-Employees=
 "; INK 2;Q
1470 LET P=P+Q
1480 PRINT 'TAB 11;"TOTAL= "; IN
K 2; BRIGHT 1;P
1490 INPUT "Summmarise Other Mon
ths? y/n ";q$
1500 IF CODE q$=78 OR CODE q$=11
0 THEN GO TO 400
1510 IF CODE q$<>89 AND CODE q$<
>121 THEN GO TO 1490
1520 GO TO 1300
1550 REM **SUMMARISE YEAR**
1560 CLS : PRINT AT 0,3;"RESULTS
 BY YEAR"
1570 PRINT L$
1580 PRINT AT 3,3;"Name";AT 3,16
;"Total Y.T.D"
1590 PRINT L$
1600 LET X=0: LET U=0
1610 DIM Z(12)
1620 FOR m=1 TO 12
1630 FOR n=1 TO 12
1640 LET Z(m)=Z(m)+T(m,n)
1650 LET U=U+V(m,n)
1660 IF n=12 THEN GO SUB 1710
1670 NEXT n: NEXT m
1680 PRINT AT 21,3;"Press Any Ke
y to Continue"
1690 PAUSE 0
1700 GO TO 400
1710 PRINT TAB 3;S$(m);TAB 16; I
NK 2;Z(m)
1720 LET X=X+Z(m)
1730 IF m=12 THEN PRINT TAB 5;"S
ub Total= "; INK 2;X
1740 IF m=12 THEN PRINT TAB 2;"E
x-Employees= "; INK 2;U: LET X=X
+U
1750 IF m=12 THEN PRINT TAB 9;"T
OTAL= "; INK 2; BRIGHT 1;X
1760 RETURN
1800 REM **SAVE REPORT**
1810 CLS : SAVE "salesR" LINE 40
0
1820 PRINT AT 10,0; INK 1;"REWIN
D,then any key to VERIFY"
1830 PAUSE 0: VERIFY "salesR"
1840 CLS : PRINT AT 10,3; INK 1;
"SALES REPORT VERIFIED"
1850 STOP
```

The ZX81 soft selection

In which Nick Pearce scrutinises the latest software packages for the ZX1.

ZX81/TS 1000 Programs for Young Programmers — Linda Hurley and Stuart Nicholls

Programming for Young Programmers is a very well produced book containing some 40 programs for the complete beginner. It is complemented by a cassette containing some additional games and extended listings for six of the programs in the book.

Taking the book first. This really is for the novice and assumes absolutely no knowledge of computing or the BASIC language. The only part of the Sinclair manual which needs to be read are the setting-up instructions.

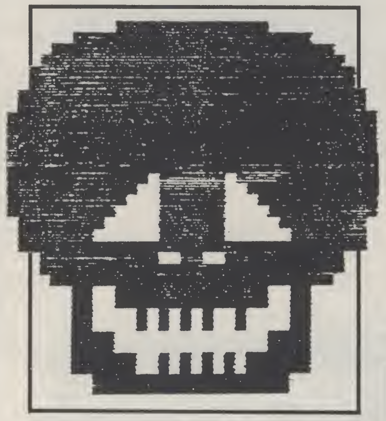
The book will be particularly useful as a means of familiarising the young user with the ZX81 keyboard. Programs are in the main short (they all fit easily into 1K) and are clearly set out with colours used effectively to highlight the Shift Graphics keys. Special 'keyboard maps' are used to assist in locating keys the first time they are encountered.

The programs are all very good. Some of them are only a few lines long and the user is able to run some effective and absorbing programs immediately with the minimum of keying-in. Just right for the young beginner! The book follows a logical sequence starting with programs which manipulate and display words, through drawing with the computer and picture displays, and on to movement and games. There is even a 'help' section at the end to aid fault finding of the user's own initial programming attempts.

The book contains a host of good ideas for the budding programmer although there is little in the way of explanation of *how* the programs work. The cassette takes things a little further and leads on to the Sinclair manual and more advanced studies.

The author has struck the right balance with this book which is likely to prove a favourite and a valuable teaching aid.

The cassette contains a good range of programs. 'Bomber' and 'Mazer' are both 1K games written entirely in machine code. 'Bomber' is particularly good — you have to obliterate the city before you crash into any of its buildings — and compares well with 16K versions on the market. 'Mazer' is a maze game in which you are chased by five ghosts; you score each time your character moves and the object is to avoid being captured for as long as possible.



'Golums' is a board/adventure type game which performs well although the action is rather slow. It is written almost entirely in BASIC and is readily LISTed with the intention of introducing the user to the rudiments of computer gaming. REM statements are liberally dispersed throughout the listing to guide the user through the program. An eight page booklet provided with the cassette contains an explanation of some aspects of the 'Golums' listing.

The remaining six programs extend some of the listings given in the book and each requires a little more than 1K. The booklet draws attention to some of the lessons which can be learnt from the listings and indicates ways in which they might be extended and enhanced.

The book and cassette together provide a very useful learniong package and are highly commended. They will undoubtedly be a source of ideas and inspiration for many young ZX81 (and TS 1000) owners.

The book and cassette are published by McGraw-Hill Book Co (UK) Ltd, Shoppenhangers Road, Maidenhead, Berkshire.

City Patrol/Saboteur — Macronics

'City Patrol' is a superb high speed action game set in a futuristic city which you have to defend from alien suicide ships.

The moving screen display is first class. The city consists of four streets of skyscraper blocks giving a 3D effect, and judicious use of the control keys allows you to move slowly, or at breakneck speed, in either direction as you search out the aliens. They are tantalisingly difficult to capture as they pass behind buildings and

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descend to ground level. If they reach the ground, their mission is accomplished and they set off a series of explosions which can destroy a large portion of your beloved city. There is a scoring system, but I was usually too absorbed in chasing the aliens to worry about my score — more often than not it seemed to be negative. All in all, 'City Patrol' is a very impressive game.

'Saboteur' is another novel game from Macronics for the ZX81, but not in my opinion as absorbing as 'City Patrol'. Nevertheless, it is based on a good idea and runs faultlessly.

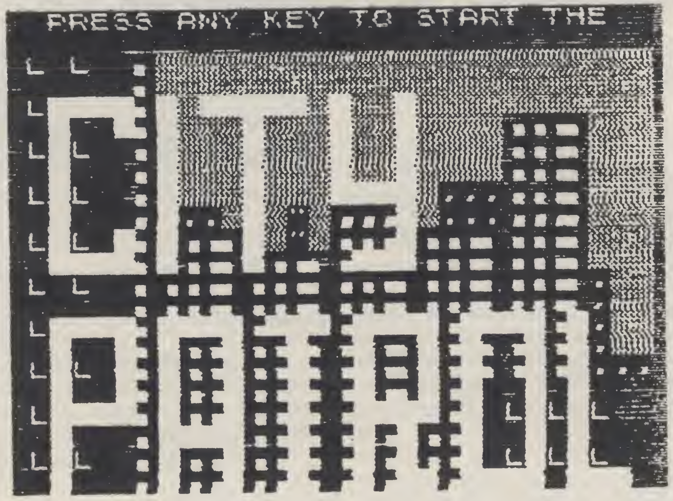
In this game the screen represents a plan of a compound containing randomly placed boxes of ammunition. You can either be the guard, who has to protect the ammunition, or the saboteur who must blow up as much of it as he/she can, with the computer taking the opposing character.

Your character is moved around the compound in the usual way. If you are the saboteur, you must find a suitable place to plant your charge and retreat a safe distance before it explodes. If you opt to take the role of the guard, you can adopt one of two alternative strategies: try and guess where the saboteur will go, and get there first; or attempt to trap the saboteur in a corner.

Both 'City Patrol' and 'Saboteur' are written largely in machine code, but the programs can be LISTed; indeed the parameters of Saboteur can be altered using POKE commands to make the game more difficult — I must admit I found it hard enough as it was. Both games require 16K of RAM.

These Macronics cassettes are attractively boxed and well presented with full instructions on the cassette insert cards.

City Patrol and Saboteur cost £5.00 each from Macronics Systems Ltd, 26 Spiers Close, Knowle, Solihull, West Midlands.



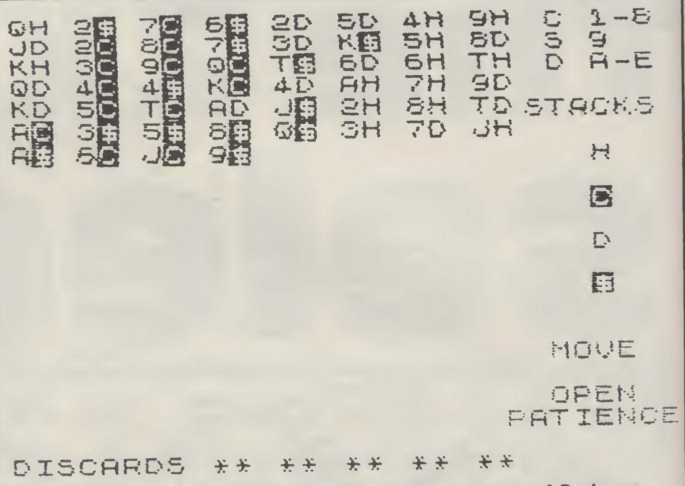
The opening display from the game City Patrol.

Stones/Open Patience — Geoff Lee

'Stones' is a board game which has the potential to drive you to utter despair as you try to anticipate where your final stone will land. The board, which is displayed on screen throughout each game, consists of eight pairs of cups, your's lined up against your opponent's. At the start, each cup contains an equal number of stones (from one — not too hard on the grey matter — to six — impossible). To move, you specify one of the pairs of cups, the stones in that cup are taken out and distributed one at a time in cups going anticlockwise around the board.

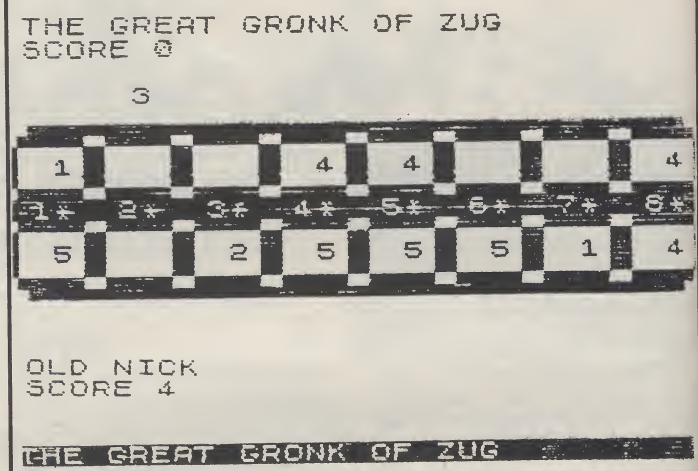
To score, your last stone has to land in an empty cup and you score points equivalent to the number of stones in your opponent's cup opposite that empty cup — otherwise, movement around the board continues with your last stone plus those in the cup your last stone reached being distributed anticlockwise, and so on.

You can play against a human opponent, or against the computer (playing as the 'Great Gronk' or 'Zig' or 'Jeremy the Jiving Giraffe', or some such other unlikely character). Luckily, the computer does not seem to well up on strategy and is readily beaten providing you play with only a few stones in each cup so as not to confuse yourself unduly.



```
QH 2S 7C 6S 2D 5D 4H 9H C 1-8
JD 2C 8C 7S 3D KS 5H 8D S 9
KH 3C 9C QC TS 6D 6H TH D A-E
QD 4C 4S KC 4D AH 7H 9D
KD 5C TC AD JS 2H 8H TD STACKS
AS 3S 5S 8S QS 3H 7D JH
AS 5C JC 9S
                              H

                              C

                              D

                              S


                            MOVE

                            OPEN
                          PATIENCE

DISCARDS ** ** ** ** **
```

A sample screen illustration from Geoff Lee's game of Patience.



```
THE GREAT GRONK OF ZUG
SCORE 0

    3

 1           4    4              4
 1*   2*   3*   4*   5*   6*   7*   8*
 5         2    5    5    5    1    4

OLD NICK
SCORE 4

THE GREAT GRONK OF ZUG
```

An example screen display from Stones.

The ZX81 keeps score perfectly. Indeed, this game is well suited to a computer — it could be very difficult to keep track of moves and scores otherwise. Not so with 'Open Patience' on the 'B' side of this cassette. This is a simulation of the card game of that name, which I think I would prefer to play with a real pack of cards. The display is good, but why play a game such as this using a computer, except maybe to prevent cheating? Technically, the game performed well and does not permit illegal moves.

The pack of cards is displayed laid out face upwards in eight columns. The object is to get the cards onto the suit stacks in ascending order. You can select either four or five discard stacks. The lack of playing card figures in the ZX81 character set is as always a disadvantage in card game simulations, but I had no problems reading the display notation adopted by Geoff Lee.

Bot games worked well and had adequate on-screen instructions. They require 16K RAM and take about six minutes to LOAD.

Stones and Open Patience costs £4.50 from Geoff Lee, 5 Westbourne Road, Islington, London N7.

Eights — Hardy Software

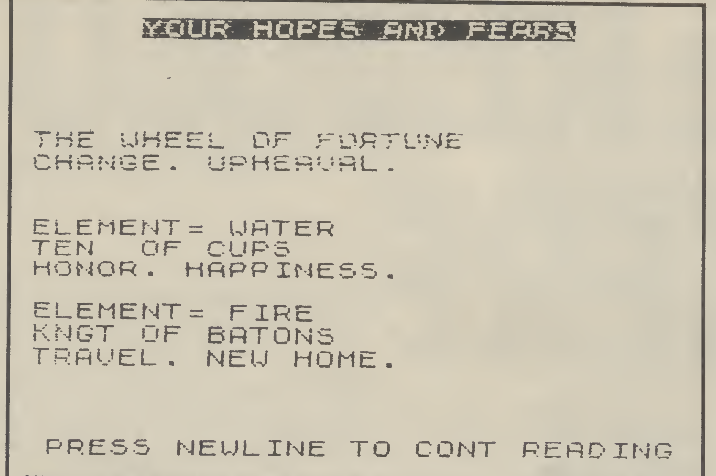
Also a card game, 'Eights' is identical to the traditional game of the same name in which your opponent is the

ZX81. The computer displays and manipulates the cards and keeps both scores.

It is a game in which strategy is important. The program is apparently based on algorithms originally developed for a TRS-80 (is this blasphemy?) version of the game; whatever, it is certainly hard to beat. The computer has an advantage, of course, its electronic memory can remember the played cards much more readily than the humble human. As expected, the program obeys all the rules of Eights and will not countenance cheating. The program is long and uses most of the expanded ZX81's RAM.

Eights costs £4.95 and is available from Hardy Software, 18 Velindre Place, Whitchurch, Cardiff CF4 2AN.

Tarot — MP Software



```
YOUR HOPES AND FEARS


THE WHEEL OF FORTUNE
CHANGE. UPHEAVAL.


ELEMENT= WATER
TEN  OF CUPS
HONOR. HAPPINESS.

ELEMENT= FIRE
KNGT OF BATONS
TRAVEL. NEW HOME.


 PRESS NEWLINE TO CONT READING
```

What do the bits and bytes have in store for you — check out the Tarot package from MP Software.

'Tarot' by MP Software is a self-contained tarot reader intended to enable the user to receive enlightenment using this ancient method of fortune telling. For the uninitiated, the tarot uses a pack of 78 cards made up of two sections, known as the major and minor 'arcanas'. The major arcana is similar to an ordinary pack of playing cards with four suits named wands, cups, swords and pentacles, with an extra card, the page, in each suit. The pack is shuffled and dealt out face down in an arrangement known as a 'lay'. The cards are revealed and from their position and meanings interpretations are made which are intended to enlighten the user on aspects of his or her problem or query.

MP's simulation is written in BASIC and takes a little over four minutes to LOAD. To start, brief instructions explaining how to use the program are given on screen. A reading is given under seven separate headings — the state of mind and body, home life, etc, each comprising three cards together with their interpretation.

To benefit from a reading it is important to have a specific problem in mind and to concentrate on that problem as the reading continues. Whether it leads to a solution will depend on how seriously you take the taret as a form of psychology, and whether you believe your state of mind can influence the random selection of a computer. Some of the mysticism of the tarot may be lost by having readings readily available on your ZX81.

Tarot has apparently been written with the aid of a practising Magi, indeed MP Software claim the authort is descended from an 18th century mystic, William Blake. For £15 one is entitled to a high level of 'expert' input, although at that high price this cassette is likely to appeal more to the already enlightened tarot user than the interested ZX81 owner. I cannot see it converting many sceptics.

Tarot costs £15 from MP Software, 3 Pine View Close, Haslemere, Surrey GU27 1DU.

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THE REVOLUTION IS HERE

FIFTH

BY RICHARD TAYLOR

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*Personal Computer News said:

"Fifth provides an excellent set of com-mands for programming arcade type games and makes it easy for you to write fast moving games in Basic."

The packages come with an extensive manual, a demonstration program and the fifth interpreter. The commands are entered as words into your program and give you INTERRUPT driven, fast, high resolution SPRITE graphics with-out losing the simplicity of Basic.

Buy FIFTH and get a City Bomber FREE!

Just type in this program by Richard Taylor with your Fifth Interpreter.

```
   2 REM *          BOMBER          *
   3 REM *   By RICHARD TAYLOR     *
   4 REM * © CRL September '83 *
   5 REM ************************
   6 REM
  10 RANDOMIZE 1000
  20 RANDOMIZE USR 61030
  30 RANDOMIZE : BORDER 6
  40 OVER 0: INVERSE 0: FLASH 0
  50 BRIGHT 0: INK 0: PAPER 7
  60 CLS
  70 GO SUB 9000
  80 GO SUB 8000
  90 LET Hi=0: LET z=1: LET Scor
e=0
 100 CLS : PRINT "  HI:";Hi;TAB
20;"SCORE:";Score
 110 PLOT 0,163: DRAW 255,0
 120 LET a=4000: REM LIMIT a
 130 LET a=6000: REM INTERACT a
 140 GO SUB 3000
 150 LET x=0: LET y=50: REM MOVE
 Plane,x,y
 160 LET x=255: LET a=30: REM MO
VE Enemy,x,a
 170 GO SUB 2000: GO TO 170
1000 LET a=0: LET b=176
1010 REM MOVE Plane,a,b\ENABLE P
lane
1020 REM ALL Bomb\MOVE Bomb,a,b
1030 REM ENABLE Bomb
1040 REM MOVE Enemy,a,b\ENABLE E
nemy
1050 CLS
1060 FOR a=0 TO 7
1070 PRINT PAPER a;: REM FILL
1080 BEEP .1,a*5: NEXT a
1090 PAUSE 25: FOR a=60 TO 0 STE
P -1: BEEP .005,a: NEXT a
1100 FOR c=0 TO 1000 STEP 20
1110 LET a=10: LET b=3: LET d=50
1120 REM SOUND a,b,c,d
1130 NEXT c
1140 LET a$="SCORE:"+STR$ Score
1150 LET x=0: LET y=50: LET t=2:
 LET w=3
1160 REM TEMPS\LARGE
1170 IF Hi>Score THEN GO TO 1200
1180 LET Hi=Score: LET a$="A New
 HIGH SCORE"
1190 LET x=60: LET y=100: LET t=
2: LET w=1: PRINT INK 1;: REM LA
RGE
1200 PRINT #0; FLASH 1;"         A
 New Level? [y/n]         "
1210 IF INKEY$<>"" THEN GO TO 12
10
1220 IF INKEY$="n" OR INKEY$="N"
 THEN GO TO 1500
1230 IF INKEY$<>"y" AND INKEY$<>
"Y" THEN GO TO 1220
1240 INPUT "New Level? ";Level
1250 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 1240
1260 GO TO 90
1500 INPUT INKEY$: PRINT #0; FLA
SH 1;"        Another Game? [y/n]
  "
1510 IF INKEY$<>"" THEN GO TO 15
10
1520 IF INKEY$="y" OR INKEY$="Y"
 THEN LET Score=0: LET z=1: GO T
O 100
1530 IF INKEY$<>"n" AND INKEY$<>
N" THEN GO TO 1520
1540 LET a$="OK": LET w=16: LET
t=22
1550 CLS
1560 LET x=0: LET y=0: REM TEMPS
\LARGE
1570 LET a=21: LET b=31: REM GET
 x,y,a,b,a$
1580 FOR a=0 TO 21: LET b=a*.687
5
1590 REM PUT a,b,a$
1600 PAUSE 5: NEXT a
1610 LET a=INT (RND*8): PAPER a:
 BORDER a: CLS : BEEP 1,-10
1620 GO TO 1610
2000 LET a$=INKEY$: IF a$="" THE
N RETURN
2010 IF a$="6" THEN LET y=y+1+(L
evel<2): LET Score=Score-2
2020 IF a$="7" THEN LET y=y-1-(L
evel<2): LET Score=Score-10
2025 PRINT AT 0,26;Score;"  "
2030 IF y<20 THEN LET y=20
2032 IF y>168 THEN LET y=168
2035 REM MOVE Plane,COLUMN Plane
,y
2040 IF a$<>"0" THEN RETURN
2050 REM USE Bomb,z
2060 LET z=z+1: IF z=4 THEN LET
z=1
2070 REM LET a=LINE Plane\LET b=
COLUMN Plane\LET c=LINE Bomb
2075 IF c<>176 THEN RETURN
2080 LET a=a+10: LET c=(INT ((c+
4)/8))-32*(c>250): REM MOVE Bomb
,b,a
2090 RETURN
3000 FOR a=2 TO 31: LET b=INT (R
ND*10)+1: IF RND>.8 THEN GO TO 3
040
3010 LET d=INT (RND*5): FOR c=21
 TO 21-b STEP -1
3020 PRINT AT c,a; INK d; BRIGHT
 RND;"▦": BEEP .005,c+25: NEXT c
3030 PRINT AT c,a; INK d;"⌂"
3040 NEXT a: RETURN
4000 REM LMTPARAM
4010 IF h$="plane" THEN GO TO 50
00
4015 IF h$="enemy" THEN GO TO 45
00
4020 LET o=176: REM LET p=CURREN
T h$\USE h$,h\MOVE h$,COLUMN h$,
o\ENABLE h$\USE h$,p
4030 CONTINUE
4500 REM LET o=LINE enemy
4510 LET o=o+11+INT (RND*6): IF
o>=150 THEN LET o=150
4520 IF o<20 THEN LET o=20
4530 LET p=255: REM MOVE enemy,p
,o\ENABLE enemy
4540 CONTINUE
5000 REM LET y=LINE Plane
5010 LET p=0: LET y=y+4: IF y>=1
68 THEN GO TO 5500
5020 REM MOVE Plane,p,y\ENABLE P
lane
5030 LET Score=Score-1: PRINT AT
 0,26;Score;"  "
5040 BEEP .005,60: CONTINUE
5500 LET a=176: LET b=0: REM MOV
E Plane,b,a\ENABLE Plane
5510 REM MOVE Enemy,b,a\ENABLE E
nemy
5520 REM ALL Bomb\MOVE Bomb,b,a\
ENABLE Bomb
5530 POKE 23681,0: CLS
5540 LET a$="YOU HAVE LANDED"
5550 LET w=2: LET t=1: LET x=0:
LET y=0
5560 PRINT INK 2;: REM LARGE
5570 LET Score=Score+200
5580 GO TO 1090
6000 REM INTPARAM
6010 IF h$="bomb" OR i$="bomb" T
HEN GO TO 7000
6020 IF h$="plane" OR i$="plane"
 THEN POKE 23681,0: GO TO 1000
6030 LET p=255: LET o=50: REM MO
VE enemy,p,o\ENABLE enemy
6040 CONTINUE
7000 IF h$="enemy" OR i$="enemy"
 THEN GO TO 7500
7005 IF i$="bomb" THEN LET h=i
7010 LET o=176: REM LET p=CURREN
T Bomb\USE Bomb,h\LET q=LINE Bom
b\LET r=COLUMN Bomb\MOVE Bomb,CO
LUMN Bomb,o\ENABLE Bomb\USE Bomb
,p
7020 LET q=INT (q/8): LET r=INT
(r/8): IF r>31 THEN LET r=31
7025 IF q>21 THEN LET q=21
7030 LET p=q+INT (RND*5)+1: IF p
>21 THEN LET p=21
7035 FOR o=q TO 10 STEP -1: PRIN
T AT o,r-1+(r=0);" ";AT o,r;" ";
AT o,r+1-(r=31);" ": BEEP .01,o+
30: NEXT o
7040 FOR o=q TO p: PRINT AT o,r-
1+(r=0);" ";AT o,r;" ";AT o,r+1-
(r=31);" ": BEEP .01,o+30: NEXT
o
7070 LET Score=Score+8-(Level*2)
: PRINT AT 0,26;Score;"  "
7080 CONTINUE
7500 LET o=50: REM MOVE Enemy,CO
LUMN Enemy,o\ENABLE Enemy
7510 IF h$="bomb" THEN LET i=h
7520 REM LET p=CURRENT Bomb\USE
Bomb,i\MOVE Bomb,COLUMN Bomb,o\E
NABLE Bomb\USE Bomb,p
7530 CONTINUE
8000 LET a$="BOMBER": LET x=8
8010 LET y=0: LET t=2: LET w=5
8020 PRINT PAPER 5; BRIGHT 1;"
8030 REM LARGE
8040 PLOT 0,160: DRAW 255,0
8050 LET a$="  A Game using"
8060 LET x=0: LET y=25
8070 LET t=1: LET w=2
8080 REM TEMPS\LARGE
8090 PLOT 0,0: DRAW 255,0
8100 DRAW 0,175: DRAW -255,0
8110 DRAW 0,-175: LET t=3
8120 LET w=6: LET x=8
8130 LET y=35: LET a$="FIFTH"
8140 PRINT INK 2;: REM LARGE
8150 LET t=2: LET w=1
8160 LET x=55: LET y=65
8170 LET a$="By RICHARD TAYLOR"
8180 PRINT INK 1;: REM LARGE
8190 PRINT AT 12,5;"Key 6 to mov
e down"
8200 PRINT AT 14,5;"Key 7 to mov
e up"
8210 PRINT AT 16,5;"Key 0 to dro
p a bomb"
8220 PRINT AT 18,3;"  You must c
lear a path to";AT 19,3;"land on
."
8230 LET a=3: REM OBJECT Bomb,a
8240 LET a=1: REM OBJECT Plane,a
8250 REM OBJECT Enemy,a
8260 REM PRINT Bomb,●
8270 REM PRINT Plane,▬\PRINT Ene
my,▬
8280 LET a=1: LET d=2: LET b=3:
LET c=6
8290 REM SPEED Bomb,b,c
8300 REM SPEED Plane,a,a
8310 REM SPEED Enemy,d,a
8320 PRINT INK 2;: REM COLOUR Bo
mb
8330 PRINT INK 1;: REM COLOUR En
emy
8340 LET a=7: REM VECTOR Bomb,a
8350 LET a=4: REM VECTOR Plane,a
8360 LET a=12: REM VECTOR Enemy,
a
8370 FOR c=3 TO 13 STEP 10
8380 FOR a=0 TO 500 STEP 10
8390 LET b=5: LET d=80
8400 REM SOUND b,c,d,a
8410 NEXT a: NEXT c
8420 PAUSE 100
8430 BEEP .2,-12: BEEP .2,-10: B
EEP .2,-8: BEEP .2,-12: BEEP .2,
-12: BEEP .2,-10: BEEP .2,-8: BE
EP .2,-7: BEEP .2,-5: BEEP .2,-5
: BEEP .2,-8: BEEP .2,-7: BEEP .
2,-5: BEEP .3,-5
8440 PAUSE 30
8450 FOR a=0 TO 7: PAPER a
8460 INK 9: PRINT PAPER a-1+8*(a
=0); INK 8;: REM REPLACE
8470 LET b=40: LET c=5: LET d=0:
 LET e=90+a
8480 REM SOUND b,c,d,e
8490 NEXT a: PAPER 7: INK 0
8500 LET a$="   Press any key to
 continue   "
8510 PRINT #0;AT 1,0; BRIGHT 1;a
$
8520 PAUSE 5: LET a$=a$(2 TO )+a
$(1)
8530 IF INKEY$="" THEN GO TO 851
0
8540 CLS
8550 PRINT AT 17,0; FLASH 1; BRI
GHT 1;"SELECT LEVEL:"
8560 PRINT "0 - Easy"
8570 PRINT "1 - Medium"
8580 PRINT "2 - Hard"
8590 PRINT "3 - Very Hard"
8600 INPUT "Please Select:";Leve
l
8610 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 8600
8615 REM ERASE Plane
8620 RETURN
9000 RESTORE
9010 FOR a=USR "a" TO USR "a"+47
9020 READ b: POKE a,b: NEXT a
9030 RETURN
9040 DATA 0,0,0,0,56,124,124,56
9050 DATA 255,153,153,255,255,15
3,153,255
9060 DATA 24,60,126,255,255,153,
153,255
9070 DATA 0,152,145,159,223,153,
153,255
9080 DATA 0,0,249,35,255,255,16,
0
9090 DATA 0,0,159,196,255,255,4,
0
9500 SAVE "Bomber" LINE 9990: SA
VE "Data"CODE 61030,4338
9990 CLEAR 61029: LOAD ""CODE
9999 RUN
```

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Sinclair On Television

No sooner had the excitement of the long-awaited ZX Microdrives died down, but Sir Clive unveils one of his other long standing projects — the flat-screen television.

The Sinclair 2'' flat-screen television incorporating just a single chip was introduced to a 'suspecting' public following a six year, £4 million development programme. Priced at £79.95, the package is just slightly smaller than the average paperback book, measuring 5½'' by 3½'' by 1¼'', and weighs in at 9½ ounces.

Featuring high-quality video reception and extremely low power consumption, the flat-screen television includes only two controls: on/off-volume and tuner. A special Polaroid battery provides power for up to 15 hours of viewing. It has also been designed so that it can be used in most countries around the world — one of the notable exceptions to this standard is the UHF transmissions from France.

There are two key design features which make the Sinclair flat-screen television possible — the first being the cathode ray tube (CRT). The CRT provides up to three times the brightness, uses between one quarter and one tenth the power and, by positioning the electron gun to the side and not the rear, eliminates most of the depth of a conventional CRT. Manufacture of the tube is subcontracted to the Timex facility in Dundee.

The other amazing breakthrough has been the single integrated circuit designed by Sinclair Research and Ferranti Ltd, which handles almost all of the circuitry requirements. Employing Ferranti's extremely advanced FAB2 CDI process, the IC uses innovative digital techniques to monitor automatically video and audio inputs and to adjust the receiver circuitry for local broadcast standards.

Special features of the IC include integrated sound selectivity, video innovations to eliminate image problems in the UHF channel and an advanced synthesised scan generator to control the complex waveforms needed to scan the flat CRT. It runs a check 50 times a second to ensure picture hold.

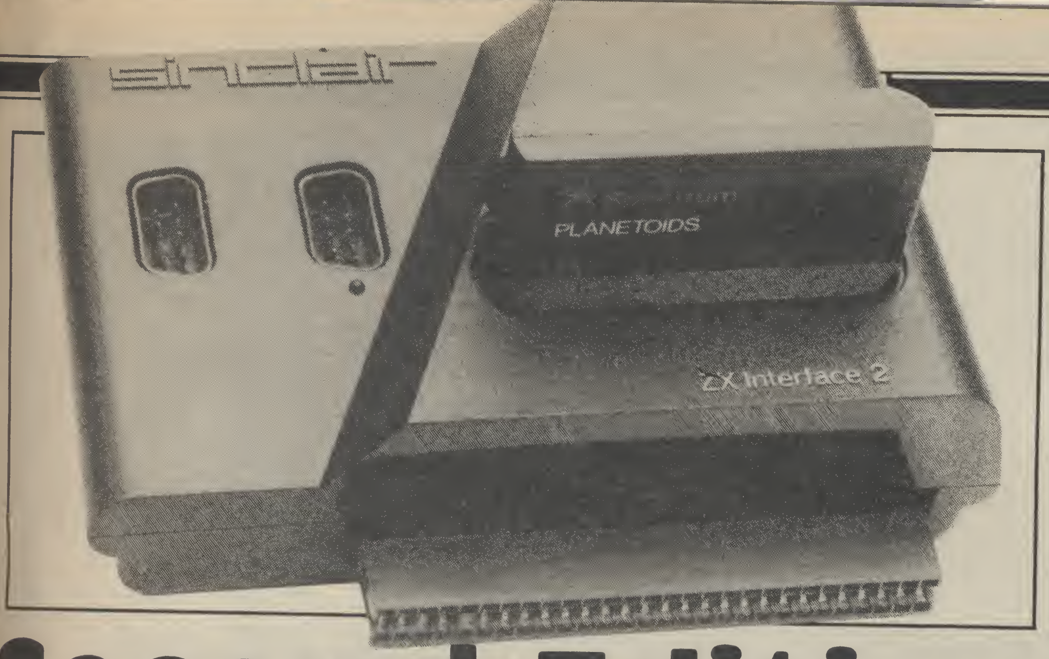
Sinclair Research have also designed a specially sensitive tuner, with up to 90% power savings.

The television will be available at first only by mail order. Sinclair Research have already made the announcements that initial stocks will be limited, but as production builds up they are hoping to soon manufacture 10,000 units per month. UK retail and export sales are expected to take place in the first half of 1984.

Complete with foldaway aerial, a personal earphone, soft-carrying case and battery, the new television is priced at £79.95. Polaroid 6V lithium batteries are available seperately for a pack of three, and a mains adaptor will be offered at £7.95.

Said Sir Clive at the flat-screen's press lunch ''I believe it, and its successors, can achieve for television what the transisitor radio did for wireless, and create a new one-person product''. It could also be used for an on-board screen if one was thinking of producing a business computer which would need some kind of on-board screen...but enough of this 'ZX83 speculation'.

For more information on the flat-screen television, you can contact the TV Division, Sinclair Research Limited, Stanhope Road, Camberley, Surrey GU15 3PS or 'phone 0276 62111.



Second Edition

ZX Spectrum owners can now benefit from the Interface 2 unit, a new add-on from Sinclair Research which allows users to attach standard joysticks and fast-loading ROM cartridge software.

Priced at £19.95, ZX Interface 2 plugs directly into the Spectrum's rear expansion port or the expansion port of the ZX Interface 1 unit. The top of the Interface 2 unit includes a 'porthole' for ROM cartridges and two joystick ports accepting standard 9-way D plugs. Everything needed to match joystick to Spectrum (and the software) is built into the Interface 2. Also, once connected, the joysticks will work with either ROM cartridge software, cassette or ZX Microdrive programs. The unit also includes an expansion port at the rear so that the ZX Printer can be attached.

Complimenting the ZX Interface 2 unit, Sinclair Research have made available 10 programs on ROM cartridge, six of which were previously available on cassette. In addition, the titles on ROM cartridge will work on the 16K computer as well as the 48K version, even if the original programs were written in 48K.

Priced at £14.95, the six 'old' programs released on ROM cartridge are Space Raiders, Planetoids, Hungry Horace, Horace and the Spiders, Chess and Backgammon. A further four programs are now available, culled from the software house Ultimate Play The Game. These are PSSST, Jet Pac, Cookie and Tranz Am.

The ZX Interface 2 unit and the ROM cartridge are initially available by mail order only. For further information, get in touch with Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS. Telephone enquiries can be made on 0276 685311.

Six Of The Best

Sinclair Research have expanded its range of software with six new cassette applications for the ZX Spectrum and ZX81.

First up there are two programing and utility programs for the ZX Spectrum. Both written by Crystal Computing, these are titled Monitor and Disassembler (for the 16/48K) and Zeus Assembler (for the 48K model). Monitor and Disassembler provides a powerful disassember so that you can translate code into comprehensive assembly language instruction. Thus, you will be able to examine the BASIC ROM in your Spectrum and also analyse your own machine code routines. The Monitor provides the user with an extensive set of facilities to aid the entry, inspection, and debugging of your programs.

The Zeus Assembler package has been designed to simplify the process of producing machine code programs, enabling the user to write in assembly language instructions. Both packages are priced at £12.95.

Sinclair Research have also produced a package designed to frustrate in much the same way as the 'cube puzzles' have done. Their game, Flippit, looks simple but involves the same kind of patience you need for the cube. In this game for your 16/48K Spectrum, you have to manoeuver nine 'Flippit' pieces, in search of the elusive magic square. Written by Lez Peranto, this cassette is priced at £9.95.

Of great interest to Sir Clive and other Mensa enthusiasts, comes a package written by Victor Serebriakoff, International President of Mensa, called Cattell IQ Test. Designed to operate on the 48K Spectrum, this program will calculate your IQ according to the Cattell Scall IIIA test, which is then timed, marked immediately and the marks standardised against your age. The package is priced at £12.95.

Last for the ZX Spectrum, comes an arcade game called Chequered Flag. Written by Psion for the 48K computer, this program puts you in the position of being a Formula One racing driver. With a choice of three different cars and 10 different circuits, you are in control of a whole bank of instruments. So, it's a case of keeping one eye on the road and one on the instrument panel if you don't want to end up in a ditch! This program is available for £6.95.

Only one new cassette is available for the ZX81 with 16K memory. Titled Mothership, the program offers a three dimensional space adventure. The package is priced at £4.95.

Profitting From Experience

Sinclair Research announced sharply increased profits before taxation and exceptional item of £14.03 million for the year ended 31 March 1983. The company's turnover doubled to £54.53 million (last year it was £27.17 million) and earnings per share were 207p against 106p previously.

Writing in Sinclair's annual report company chairman, Clive Sinclair, called the figures 'encouraging', and noted that Sinclair's ZX Spectrum personal computer, introduced in 1982, "had become easily the best selling machine in the UK and in a number of overseas markets".

Attributing Sinclair's 'strong position in the personal computer market to its technical and marketing leadership', he added that "there remains much scope for innovation in the field and I believe we will continue to lead the world with future products.

"Because we will never be free from competition we plan to introduce products in new market areas to expand the company and maintain our margins. In particular we expect to be leaders in the flat screen television field where we are confident that we have the best technology."

We wish Sir Clive well for the coming year — so, how about the ZX83 then?

'Woolies' Move Into The Micro Market

In a major move into the micro market, Woolworth have become the largest chain to stock computers in the UK.

Initially, over 160 Woolworth stores will stock a wide range of micros, including the ZX Spectrum, the Atari 600XL, the Commodore VIC 20 and the Commodore 64. A less extensive selection of home computers is to be marketed through other large Woolworth stores. However, due to the popularity of the ZX Spectrum, you should be able to buy either the 16K or 48K version in no less than 500 branches of Woolworth.

All the computers will be backed by a comprehensive range of games and educational software.

Software .... In Brief

- Software Cottage is a software house producing programs with a definite musical bent. But you don't have to be a musical genius to be able to use them — all you need is a Spectrum or ZX81! For the Spectrum, there are two packages titled Firework Music and Tuner, both written for either version of the Spectrum. Firework Music contains two programs, one each for the treble and bass clefs, and both help beginners learn and read note names. Tuner is a challenging game for the general user with a good musical ear. You have to tune notes correctly — in a similar way to tuning a guitar. There are also four cassettes for the ZX81 user: Firework Music, similar to the Spectrum version; Music Education 1, two programs to help the beginner learn note names in the treble and bass clefs; Music Education 2, similar to ME 1 but for the alto and tenor clefs; and Music Education 3, which concentrates on rhythm and note time values. All the tapes are priced at £5, but if you buy three or more you only pay £4 per package. Further enquiries should be made to Software Cottage, 19 Westfield Drive, Loughborough, Leicester LE11 3QJ.

- Bug-Byte have, after some weeks of negotiation, signed a major distribution deal with the multinational CBS company. This will mean that distribution of Bug-Byte software will be eased — in the words of Bug-Byte's John Philips "this deal means that whether the customer orders one tape or 10,000, the order can be processed and despatched within 48 hours. Furthermore, it represents an important step forward in our worldwide expansion plans". So, without too much emphasis on Bug-Byte's plans to take over the world, it means that if you're desperately trying to get hold of their amazing Manic Miner game for your Spectrum, you shouldn't have too much problem!

- If you're a ZX81 user and live in a rural area with no user club and you crave the kind of information and news you would normally gain from a club, why not check out the ZX Broadsheet. Offering informal contact by post with ZX81 users throughout the world and the UK, ZX Broadsheet also contains a number of programs and the new issue includes a beginners' look at machine code. So, if you're interested in broadening your programming experience or you'd just like to write to a fellow user in a far distant clime, you can find out more details on the ZX Broadsheet from Nick Godwin, 4 Hurkur Crescent, Eyemouth, Berwickshire TD14 5AP, Scotland. The price of each issue of ZX Broadsheet is 60p or four international reply coupons.

- As from 19 September 1983, Quest Micro Software will continue trading under the name of Fantasy Software. The new company will market all the software currently produced by Quest, mainly The Black Hole and Violent Universe — all new software will bear the Fantasy Software label. It is the intention of Fantasy Software to publish a maximum of eight games a year. The first of these new packages is soon to be released and is called The Pyramid. Written for the 48K Spectrum, the price of the program will be £5.50. As yet, I don't know what the package will be about — but watch these pages for more information. If you can't wait that long you can try getting information straight from the horse's mouth by 'phoning 0242 583661 or writing to the people at Fantasy Software, Fauconberg Lodge, 27A St Georges Road, Cheltenham, Gloucestershire GL50 3DT.

- From October, the program from Alan Firminger called ALL-SORT S-1 has been reduced in price to £9.95. Released in March 1982, this generator program gives machine code sorts for use in BASIC on a ZX Spectrum. The price reduction is possible because the expected high level of after-sales service was not required — customers happily bought the product and managed to use the complex program without any problems. For more information on ALL-SORT S-1, write to Alan Firminger, 171 Herne Hill, London SE24 9LR.

The Sky's The Limit?

Following the successful development of Bridge Software's Ephemeris program which was released for the ZX81 and Spectrum, comes a new software package called The Night Sky.

For both the professional and amateur astronomer, this package for the 16/48K Spectrum is an observer's guide to the stars visible from the UK (from 48 degrees to 58 degrees North). Amongst its characteristics are features of over 700 stars, five magnitudes distinguished, 50 constellations identifiable and over four million different skyscapes. You can also COPY the skyscapes onto your ZX Printer.

You can use your Spectrum to create brilliant Hi-res starcharts — a different one for every minute of every night of the year. All you have to do is to input the month, date and time and a chart of the southern aspect of the sky will come up on the screen. If you press the 'W', 'N' and 'E' keys you will get the starchart for the western, northern and eastern aspects on the screen respectively.

Priced at £8.90 for the cassette and manual, The Night Sky is available from Bridge Software, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE. You could always ask them for a catalogue of their ZX81 and Spectrum software — they have a great selection.

On The Buses

Virgin Games have announced the first-ever computer games tour — by bus.

Virgin Games have bought a double decker bus which has been completely refitted and furnished with 12 computers and screens comprising the ZX Spectrum, Dragon 32, VIC 20, Oric, BBC Micro, Commodore 64 and TI 99/4A. There are plans to tour the bus to major towns from October to Christmas giving youngsters (and oldsters!) the opportunity to see computers at work, playing games and the chance to meet some of Virgin's programmers in action.

Said Virgin Games' Manging Director, Nick Alexander "We were very pleased with the launch of the first Virgin Games titles, but we wanted to do something more innovative this time. The bus would also be of general interest to people who haven't yet bought a computer and were wondering what to do with it".

To coincide with the tour of the bus, Virgin Games are launching eight new computer programs, two of which are designed to run on the Spectrum computer. The two programs soon to be available from Virgin are Racing Manager and Lojix. There is also a free competition for purchasers of the new games to enter.

For more information on the prizes in the competition and the prices of the new software packages, contact Virgin Games, 61/63 Portobello Road, London W11 3DD. Local user groups interested in a visit from the Virgin Games Bus should contact Angela Fitzgerald on 01-221 7535.

Spectrum Teacher

A new range of educational software is available from Griffen & George which should help your child learn esential word and number skills.

Available from WH Smiths stores nationwide, these packages will run on the 48K Spectrum. All the programs use appropriate teaching methods already used in schools, and are produced and evaluated in full consultation with experienced primary teachers.

The first four titles in the new range include Wordspell, which is for children aged five years upwards. With 116 separate word tests, each containing seven words, this package provides a comprehensive introduction to the key rules of English spelling. The program can also be tailored to suit your own child's ability making it a very versatile teaching aid.

Getset is designed for children of four years and upwards. In this package there are two programs which introduce the idea of grouping objects into sets. Manipulation of objects should help the user to grasp the concept of addition and subtraction.

Numberfun is an addition and subtraction package for children of five years upwards. Displayed score, rewards for correct answers and a range of choices within the programs make this package an effective learning aid.

The last package is called Tablesums and is designed to teach children of age six years and upwards. Using colourful displays, these two programs show how multiplication tables are easy to learn.

Priced at £7.99, you can find out more about these packages from Griffen & George, 285 Ealing Road, Alperton, Wembley, Middlesex HA0 1HJ.

New From Artic

Of the 21 programs Artic Computing have released, 15 of them are designed for the Spectrum and ZX81. So, with a choice like that, there must be something there for you!

There are five new packages for the ZX81, two of which are games and three moving into the educational world. The two games are Alpha Probe and Community Chest, priced at £3.95 and £4.95 respectively. Alpha Probe involves you jetting around from planet to planet, exploring as you go. Community Chest is a 'Monopoly' type game in which you have to pit your wits against the computer.

The three educational tapes are called Vocabulary Tutors. The languages the tapes are based on are French, German and Spanish and have been compiled by language teachers. The tapes are priced at £4.45 each or all three for £12.

Moving onto the Spectrum, there are 10 new packages for you to peruse, all games except for one. Dealing the odd one out, it is an educational tape for the 48K version and called A.B.C. Priced at £6.95, the program is targeted towards primary school children in the five to eight year old bracket. The child must press any key on the keyboard and an object beginning with that letter is drawn on the screen and the child is invited to spell the word.

Of the remaining nine games, seven are designed to work on the 16/48K version of the Spectrum. These include: Road Racers, a racing car game; Spectra Probe, a Spectrum version of the Alpha Probe program released for the '81; Snake, in which you must guide a pet snake around a maze of poisoned mushrooms; Millimon, in which you must kill the Millimon and a host of other insects using your laser base; Reflections, in which you are trapped in a maze of mirrors; Reversi, a version of the popular board game in which you get to play the computer; and Snooker, the pub game available now for the armchair athelete. These games are priced at £4.95 except for the last three mentioned which retail at £5.95.

Two 48K games have also been released by Artic and these are St Andrews and Jigsaw. Both priced at £5.95, the first package provides a thrilling game of golf reproducing all 18 holes on the old course of St Andrews, while the second program allows the user to put together two jigsaw puzzles.

For further information on Artic's new range of software you can write to Artic Computing Ltd, Main Street, Brandesburton, Driffield YO25 8HG. Telephone enquiries can be made on 0401 43553.

The Game Lords

Quicksilva have come up with a very impressive new batch of software releases for the Spectrum which should be well into the shops for the Christmas rush.

Perhaps their most impressive package to date is the first product to come from their software studios 'located somewhere in Hampshire'. Written by Timegate author, John Hollis, the package is designed for the 48K Spectrum and is priced at £14.95.

The package, called Games Designer, comes complete with eight games already programmed into it — and it's up to you to change any aspect of them to suit your own tastes. There are four game formats for the eight games: Invaders/Galaxians; Defender/Scramble; Asteroids; and Beserk. Having chosen the game you wish to play, you can then design your own animated graphics characters, such as aliens, ships, missiles, explosions, etc. You can also alter the sound generation, scoring, movement control, moving background and attack wave design. In short, you have a smooth arcade quality series of games which, when developed by the user, can include a limitless number of games.

The second package worthy of note in Quicksilva's new selection is 3D Ant Attack. Priced at £6.95 and designed for the 48K Spectrum, this game involves you controlling a character walking around the walled city of Antescher. The walled city is shown on the screen as a number of solid 3D blocks which can be viewed from any angle as you move your figure around.

In amongst the city, you will come across a number of roving Killer Ants which you should, of course, try to avoid. However, it must be said that the graphics do rather detract from the game — because they are so good that you end up just looking at the graphics and ignore the fact that you are being eaten alive by the ants!

Quicksilva, on seeing the tape from the author Sandy White, are supposed to have been impressed that they flew Sandy down from Scotland and signed contracts within 24 hours. Sandy White has applied for a patent for the graphics techniques used throughout the program.

Another game amongst the new releases is a definite 'fun' game. Called Bugaboo (or The Flea), you play the part of a flea trapped down a colourful cave full of wild and exotic vegatation. The game is simple to play using only two keys and addictive to say the least! The game, designed for the 48K Spectrum and priced at £6.95, uses Spanish software from Indescomp and has been written by Paco and Paco.

Quicksila are also marketing two other games they themselves describe as 'awesome'. Written for the 16/48K Spectrum comes Gridrunner, the best-selling arcade game in the States, and for the 48K Spectrum, traxx. Both games, priced at £6.95, were designed by Jeff Minter of Llamasoft and programmed by Salamander Software.

Quicksilva have also launched the Game Lords Club for games and computer enthusiasts. A £1 membership fee (redeemable against mail order purchase) will give members a regular Club Fanzine, competitions, games at special prices, previews of games and, of course, a selection of badges and T-shirts.

The address for direct mail order of Quicksilva goods is Quicksilva Mail Order, 55 Haviland Road, Ferndown Industrial Estate, Wimborne, Dorset BH21 7PY and the 'phone number is 0703 20169. For any other enquiries you could always write to Quicksilva at 13 Palmerston Road, Southampton, Hampshire SO1 1LL.

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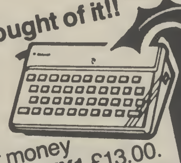

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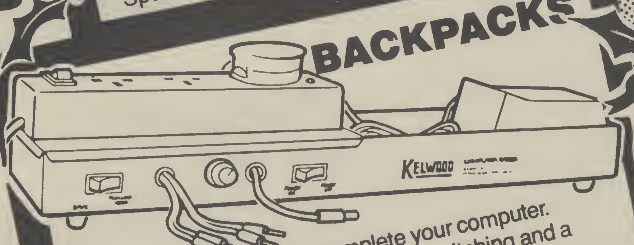

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Back Pack 5	Ref **BP5C** £26.90
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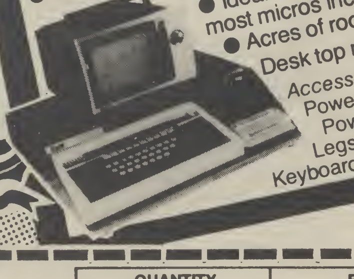

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KELWOOD COMPUTER CASES Downs Row, Moorgate, Rotherham **Tel: (0709) 63242**

Naval manoeuvres

A ZX81 version of the popular board game from MJ Downie of North Yorkshire.

Written for the 16K ZX81, this version of 'Battleships' involves you taking on the computer in a naval conflict.

In the swim

As in the game we all know and love, the idea of the game is to sink your opponent's fleet before they manage to sink yours.

When you first run the program, the computer first provides you with a few brief instructions on how to play the game. When you are sure you understand the workings of the game, the computer sets up its fleet on the right-hand playing area. Once this has been done, you position your own fleet.

You do this under instruction from the computer which invites you to give the co-ordinates of each ship in your fleet. You must position one battleship (represented by four squares), two cruisers (three squares), three destroyers (two squares) and four submarines (one square each). You position your fleet by first inputting the row co-ordinate followed by the column co-ordinate on your 10 by 10 playing grid on the left-hand part of the screen.

You begin the game by having three shots at the computer's fleet. This is done in a similar manner to how you inputted your fleet, in that the computer asks you first for the row co-ordinate followed by the column co-ordinate. The computer will then have three shots at your fleet and so on. All shots and hits are shown clearly on the screen, and the winner is the one who destroys the other's fleet first.

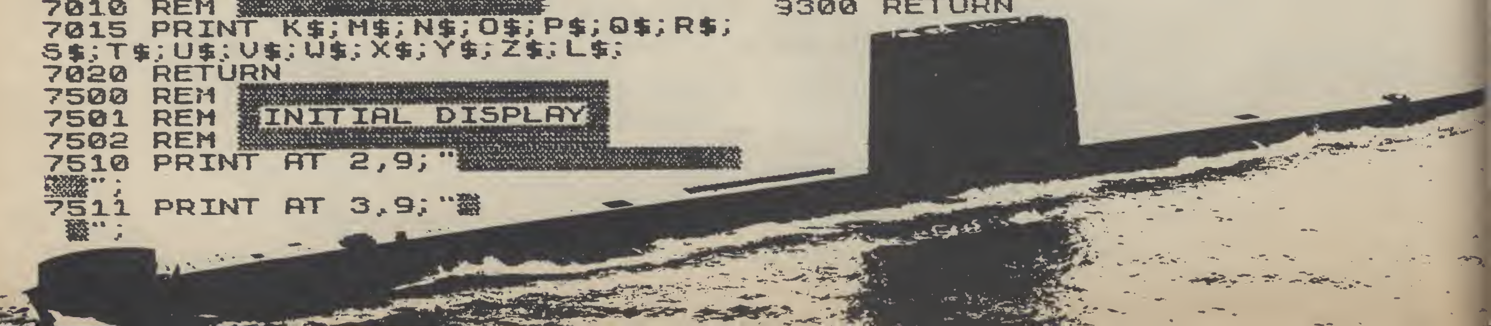
The player has the same chance of winning as the computer, so have fun!

```
   1 REM
   2 REM  COMPILED BY M.J AND
   3 REM J DOWNIE,
   4 REM
   6 CLS
   8 CLEAR
   9 GOSUB 7500
  10 FAST
  15 GOSUB 5000
  18 GOSUB 5500
  30 GOSUB 7000
  40 GOSUB 1000
  45 LET HITP=0
  47 LET HITM=0
  50 LET PLR=0
  51 LET MCN=0
  55 GOSUB 500
  56 FOR U=18 TO 21
  57 PRINT AT U,0;"
                              ";
  58 FOR I=1 TO 5
  59 NEXT I
  60 PRINT AT U,0;"
                              ";

  61 NEXT U
  70 FOR U=1 TO 100
  75 NEXT U
  90 GOSUB 2000
  95 FOR F=18 TO 21
 100 PRINT AT F,0;"
                              ";
 105 FOR I=1 TO 5
 107 NEXT I
 110 PRINT AT F,0;"
                              ";
 115 NEXT F
 117 GOTO 55
 120 GOSUB 9000
 160 PRINT AT 21,0;"HIT G FOR AN
OTHER,S TO STOP";
 170 LET D$=INKEY$
 175 IF D$<>"G" THEN IF D$<>"S"
THEN GOTO 170
 180 IF D$="G" THEN GOTO 1
 499 STOP
 500 PRINT AT 19,0;"YOUR GO, TAK
E THREE SHOTS              ";
 501 FOR V=1 TO 3
 505 LET PLR=PLR+1
 513 PRINT AT 21,0;"
                              ";

 515 PRINT AT 21,0;"SHOT NO. ";P
LR;"..FEED ROW";
 520 INPUT A
 521 IF A=0 THEN LET A=10
 522 IF A>10 THEN GOTO 515
 523 PRINT AT 21,0;"
                              ";

 525 PRINT AT 21,0;"SHOT NO. ";P
LR;"..FEED COL";
 527 INPUT B
 530 IF B>10 THEN GOTO 525
 531 IF B=0 THEN LET B=10
 532 IF A$(A,B)="X" THEN GOTO 51
1
 533 PRINT AT 21,0;"
                              ";

 535 IF A$(A,B)="*" THEN PRINT A
T 21,25;"MISSED";
 536 IF A$(A,B)<>"*" THEN IF A$(
A,B)<>"X" THEN LET HITP=HITP+1
 537 IF A$(A,B)<>"*" THEN IF A$(
A,B)<>"X" THEN PRINT AT 21,25;" 
HIT ";
 538 FOR P=1 TO 20
 539 NEXT P
 540 IF A$(A,B)="B" THEN PRINT A
T 2+A,19+B;"B";
 545 IF A$(A,B)="C" THEN PRINT A
T 2+A,19+B;"C";
 550 IF A$(A,B)="D" THEN PRINT A
T 2+A,19+B;"D";
 555 IF A$(A,B)="S" THEN PRINT A
T 2+A,19+B;"S";
 558 IF A$(A,B)="*" THEN PRINT A
T 2+A,19+B;"X";
 560 LET A$(A,B)="X"
 565 IF HITP=20 THEN GOTO 120
 600 NEXT V
 601 RETURN
1000 REM
1001 REM  PLAYER ENTRY
1002 REM
1015 FOR S=1 TO 4
1016 PRINT AT 17,0;"TAKE CARE, E
RRORS RUIN THE GAME";
1020 PRINT AT 18,0;"BATTLESHIP S
QUARE ";S;
1025 PRINT AT 19,0;"ROW..";
1027 INPUT A
1028 IF A=0 THEN LET A=10
1029 IF A>10 THEN GOTO 1027
1030 PRINT AT 19,0;"COL..";
1035 INPUT B
1036 IF B=0 THEN LET B=10
1037 IF B>10 THEN GOTO 1035
1040 LET B$(A,B)="B"
1045 PRINT AT 2+A,1+B;"B";
1050 NEXT S
1053 FOR M=1 TO 2
1054 FOR N=1 TO 3
1055 PRINT AT 18,0;"CRUISER NUMB
ER ";M;" SQUARE ";N;
1058 PRINT AT 19,0;"ROW..";
1060 INPUT A
1062 IF A>10 THEN GOTO 1060
1063 IF A=0 THEN LET A=10
1064 PRINT AT 19,0;"COL..";
1066 INPUT B
1067 IF B=0 THEN LET B=10
1068 IF B>10 THEN GOTO 1066
1070 LET B$(A,B)="C"
1075 PRINT AT 2+A,1+B;"C";
1077 NEXT N
1080 NEXT M
1090 FOR M=1 TO 3
1095 FOR N=1 TO 2
1100 PRINT AT 18,0;"DESTROYER NO
.";M;" SQUARE ";N;"    "
1110 PRINT AT 19,0;"ROW..";
1120 INPUT A
1121 IF A=0 THEN LET A=10
1122 IF A>10 THEN GOTO 1120
1125 PRINT AT 19,0;"COL..";
1130 INPUT B
1131 IF B=0 THEN LET B=10
1132 IF B>10 THEN GOTO 1130
1135 LET B$(A,B)="D"
1140 PRINT AT 2+A,1+B;"D";
1150 NEXT N
1160 NEXT M
1170 FOR S=1 TO 4
1175 PRINT AT 18,0;"SUBMARINE NU
MBER..";S;"    "
1180 PRINT AT 19,0;"ROW..";
1190 INPUT A
1191 IF A=0 THEN LET A=10
1192 IF A>10 THEN GOTO 1190
1195 PRINT AT 19,0;"COL..";
1197 INPUT B
1198 IF B=0 THEN LET B=10
1199 IF B>10 THEN GOTO 1190
1200 LET B$(A,B)="S"
1205 PRINT AT 2+A,1+B;"S";
1210 NEXT S
1220 FOR A=17 TO 21
1225 PRINT AT A,0;"
                              ";

1230 NEXT A
1250 RETURN
2000 REM
2001 REM  MACHINE FIRES BACK
2002 REM
2010 PRINT AT 19,0;"NOW ITS MY G
O, YOU CAN SIT BACK.";
2011 FOR T=1 TO 3
2022 LET MCN=MCN+1
2025 LET ZX=0
2040 LET A=INT (RND*10)+1
2050 LET B=INT (RND*10)+1
```

```
2060 IF B$(A,B)<>"*" THEN IF B$(
A,B)="X" THEN GOTO 2040
2063 PRINT AT 21,0;"
                               ";
2065 PRINT AT 21,0;"SHOT NO.";MC
N;" IS..";A;",";B;
2070 IF B$(A,B)="S" OR B$(A,B)="
B" OR B$(A,B)="C" OR B$(A,B)="D"
 THEN GOSUB 3000
2085 IF ZX=1 THEN GOTO 2125
2110 PRINT AT 18,0;"***ITS A MIS
S, WHAT A WASTE***";
2112 FOR U=1 TO 20
2115 NEXT U
2117 PRINT AT 18,0;"
                               ";
2120 LET B$(A,B)="X"
2121 PRINT AT 2+A,1+B;"X";
2125 NEXT T
2999 RETURN
3000 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
3001 REM ▒MAIN FLEET HITS▒
3002 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
3010 PRINT AT 2+A,1+B;"█";
3020 LET B$(A,B)="X"
3021 LET AA=A
3022 IF A=10 THEN LET AA=9
3030 IF B$(AA+1,B)="*" THEN LET
B$(AA+1,B)="X"
3031 IF AA+2>10 THEN GOTO 3039
3032 IF B$(AA+2,B)="*" THEN LET
B$(AA+2,B)="X"
3039 LET AA=A
3040 IF A=1 THEN LET AA=2
3050 IF B$(AA-1,B)="*" THEN LET
B$(AA-1,B)="X"
3055 IF AA-2<1 THEN GOTO 3060
3057 IF B$(AA-2,B)="*" THEN LET
B$(AA-2,B)="X"
3060 LET BB=B
3070 IF B=10 THEN LET BB=9
3080 IF B$(A,BB+1)="*" THEN LET
B$(A,B+1)="X"
3085 IF BB+2>10 THEN GOTO 3090
3087 IF B$(A,BB+2)="*" THEN LET
B$(A,BB+2)="X"
3090 LET BB=B
3100 IF B=1 THEN LET BB=2
3110 IF B$(A,BB-1)="*" THEN LET
B$(A,BB-1)="X"
3120 PRINT AT 18,0;"***ITS A HIT
***";
3130 LET ZX=1
3140 LET HITM=HITM+1
3145 IF HITM=20 THEN GOTO 120
3150 FOR U=1 TO 30
3160 NEXT U
3170 PRINT AT 18,0;"
                               ";
3180 RETURN
5000 LET M$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
5010 LET Z$=M$
5020 LET N$="▒1234567890▒▒▒▒▒▒▒▒▒
▒1234567890▒▒"
5030 LET Y$=N$
5040 LET L$="████████████████████
██████████████"
5045 LET K$=L$
5050 LET O$="▒1**********1▒▒▒▒▒▒▒
1**********1▒"
5060 LET P$="▒2**********2▒▒▒▒▒▒▒
2**********2▒"
5070 LET Q$="▒3**********3▒▒▒▒▒▒▒
3**********3▒"

5080 LET R$="▒4**********4▒▒▒▒▒▒▒
4**********4▒"
5090 LET S$="▒5**********5▒▒▒▒▒▒▒
5**********5▒"
5100 LET T$="▒6**********6▒▒▒▒▒▒▒
6**********6▒"
5110 LET U$="▒7**********7▒▒▒▒▒▒▒
7**********7▒"
5120 LET V$="▒8**********8▒▒▒▒▒▒▒
8**********8▒"
5130 LET W$="▒9**********9▒▒▒▒▒▒▒
9**********9▒"
5140 LET X$="▒0**********0▒▒▒▒▒▒▒
0**********0▒"
5150 RETURN
5500 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒
5501 REM ▒SET THE MACHINES PIECE
S▒
5502 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒
5510 DIM A$(10,10)
5511 DIM B$(10,10)
5512 DIM H$(10,10)
5518 REM ▒▒▒▒▒▒▒▒▒▒▒▒
5519 REM ▒BATTLESHIP▒
5520 REM ▒▒▒▒▒▒▒▒▒▒▒▒
5521 FOR Y=1 TO 10
5522 FOR Z=1 TO 10
5523 LET A$(Y,Z)="*"
5524 LET B$(Y,Z)="*"
5525 NEXT Z
5526 NEXT Y
5530 LET A=INT (RND*10)+1
5531 IF A<4 THEN GOTO 5530
5540 LET B=INT (RND*10)+1
5541 IF B<4 THEN GOTO 5540
5550 IF A>7 THEN GOTO 5700
5560 IF B>7 THEN GOTO 5700
5565 IF A>B THEN GOTO 5600
5567 FOR I=1 TO 4
5568 LET A$(A,B-1+I)="B"
5569 NEXT I
5570 GOTO 5730
5600 FOR I=1 TO 4
5601 LET A$(A-1+I,B)="B"
5602 NEXT I
5605 GOTO 5730
5700 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒
5701 REM ▒SETTING BSHIP AT BOTTO
M▒
5702 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒
5705 IF A>B THEN GOTO 5720
5707 FOR I=1 TO 4
5710 LET A$(A,B+1-I)="B"
5711 NEXT I
5715 GOTO 5730
5720 FOR I=1 TO 4
5721 LET A$(A+1-I,B)="B"
5722 NEXT I
5728 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
5729 REM ▒BATTLESHIP FINISHED▒
5730 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
5732 FOR J=1 TO 2
5735 LET A=INT (RND*10)+1
5736 IF A<3 THEN GOTO 5735
5737 LET B=INT (RND*10)+1
5738 IF B<3 THEN GOTO 5737
5740 IF A$(A,B)<>"*" THEN GOTO 5
735
5742 IF A>8 THEN GOTO 5800
5743 IF B>8 THEN GOTO 5800
5744 IF A>B THEN GOTO 5780
5745 FOR I=1 TO 3
5747 IF A$(A,B-1+I)<>"*" THEN GO
TO 5735
5748 NEXT I
5749 FOR I=1 TO 3
5750 LET A$(A,B-1+I)="C"
5751 NEXT I
5752 GOTO 5900
5780 FOR I=1 TO 3
5782 NEXT I
5783 FOR I=1 TO 3
5784 LET A$(A-1+I,B)="C"
5785 NEXT I
5786 GOTO 5900
5800 IF A>B THEN GOTO 5850
5802 FOR I=1 TO 3
5803 IF A$(A,B+1-I)<>"*" THEN GO
TO 5735
5804 NEXT I
```

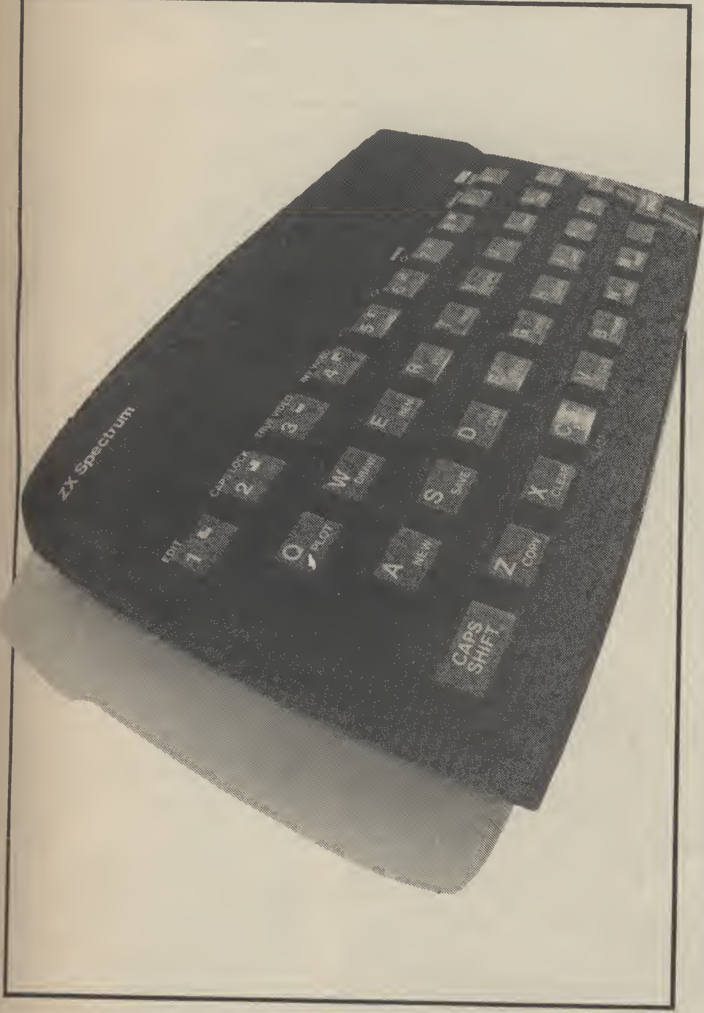
▶

```
5805 FOR I=1 TO 3
5806 LET A$(A,B+1-I)="C"
5807 NEXT I
5810 GOTO 5900
5850 FOR I=1 TO 3
5851 IF A$(A+1-I,B)<>"*" THEN GO
TO 5735
5852 NEXT I
5853 FOR I=1 TO 3
5854 LET A$(A+1-I,B)="C"
5855 NEXT I
5900 NEXT J
5908 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
5909 REM ▒DESTROYERS NEXT▒
5910 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
5911 FOR J=1 TO 3
5912 LET A=INT (RND*10)+1
5913 IF A<2 THEN GOTO 5912
5914 LET B=INT (RND*10)+1
5915 IF B<2 THEN GOTO 5914
5916 IF A$(A,B)<>"*" THEN GOTO 5
912
5920 IF A>9 THEN GOTO 5970
5921 IF B>9 THEN GOTO 5970
5922 IF A>B THEN GOTO 5950
5925 FOR I=1 TO 2
5926 IF A$(A,B-1+I)<>"*" THEN GO
TO 5912
5927 NEXT I
5930 FOR I=1 TO 2
5931 LET A$(A,B-1+I)="D"
5932 NEXT I
5933 GOTO 6000
5950 FOR I=1 TO 2
5951 IF A$(A-1+I,B)<>"*" THEN GO
TO 5912
5952 NEXT I
5953 FOR I=1 TO 2
5954 LET A$(A-1+I,B)="D"
5959 NEXT I
5960 GOTO 6000
5970 IF A>B THEN GOTO 5990
5971 FOR I=1 TO 2
5972 IF A$(A,B+1-I)<>"*" THEN GO
TO 5912
5973 NEXT I
5974 FOR I=1 TO 2
5975 LET A$(A,B+1-I)="D"
5976 NEXT I
5979 GOTO 6000
5990 FOR I=1 TO 2
5991 IF A$(A+1-I,B)<>"*" THEN GO
TO 5912
5992 NEXT I
5993 FOR I=1 TO 2
5994 LET A$(A+1-I,B)="D"
5995 NEXT I
6000 NEXT J
6100 FOR J=1 TO 4
6105 LET A=(INT (RND*10))+1
6107 LET B=(INT (RND*10))+1
6110 IF A$(A,B)<>"*" THEN GOTO 6
105
6115 LET A$(A,B)="S"
6120 NEXT J
6125 FOR X=1 TO 10
6126 FOR Y=1 TO 10
6127 LET H$(X,Y)=A$(X,Y)
6128 NEXT Y
6129 NEXT X
6999 RETURN
7000 SLOW
7008 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒
7009 REM ▒PRINT SCREEN▒
7010 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒
7015 PRINT K$;M$;N$;O$;P$;Q$;R$;
S$;T$;U$;V$;W$;X$;Y$;Z$;L$;
7020 RETURN
7500 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
7501 REM ▒INITIAL DISPLAY▒
7502 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
7510 PRINT AT 2,9;"▒▒▒▒▒▒▒▒▒▒▒▒▒
▒";
7511 PRINT AT 3,9;"▒
 ▒";
7520 PRINT AT 4,9;"▒ BATTLESHIPS
 ▒";
7522 PRINT AT 5,9;"▒
 ▒";
7525 PRINT AT 6,9;"▒▒▒▒▒▒▒▒▒▒▒▒▒
▒";
7530 PRINT AT 15,3;"DO YOU WANT
INSTRUCTIONS?"
7535 PRINT AT 18,10;"( Y OR N )"
7540 LET Q$=INKEY$
7550 IF Q$<>"Y" THEN IF Q$<>"N"
THEN GOTO 7540
7560 IF Q$="Y" THEN GOSUB 8000
7565 CLS
7600 RETURN
8000 CLS
8010 PRINT "   THE OBJECT IS TO
SINK THE "
8012 PRINT "MACHINES FLEET BEFOR
E IT SINKS  YOURS."
8015 PRINT "   THE MACHINE FIRST
 OF ALL     POSITIONS ITS OWN FL
EET."
8020 PRINT "   YOU ARE THEN ASKE
D TO INPUT  YOUR BATTLESHIPS."
8022 PRINT
8025 PRINT "ONE BATTLESHIP (4 SQ
UARES), TWO"
8030 PRINT "CRUISERS (3 SQUARES)
, THREE"
8035 PRINT "DESTROYERS (2 SQUARE
S) AND FOUR"
8040 PRINT "SUBMARINES (1 SQUARE
 EACH)."
8045 PRINT "   YOU THEN FIRE 3 S
HOTS, THE"
8050 PRINT "MACHINE HAS 3, AND S
O ON."
8055 PRINT "   LOWEST NUMBER OF
SHOTS WINS."
8060 PRINT
8101 PRINT "THE MACHINE DOES NOT
 THINK AS "
8102 PRINT "YOU DO, BUT IT HAS S
PIES TO GIVE"
8103 PRINT "IT INFORMATION ABOUT
 YOUR FLEET."
8104 PRINT "IT GETS THIS AFTER E
ACH HIT"
8106 PRINT AT 21,8;"(PLEASE WAIT
)"
8110 FOR G=1 TO 200
8120 NEXT G
8130 CLS
8140 RETURN
9000 FOR U=1 TO 20
9010 FAST
9012 FOR I=1 TO 5
9015 NEXT I
9020 SLOW
9030 NEXT U
9040 IF HITP=20 THEN PRINT AT 17
,0;"WELL DONE YOU [illegible]
";
9050 IF HITP=20 THEN GOTO 9300
9060 PRINT AT 17,0;"I HAVE BEATE
N YOU.";
9070 PRINT AT 18,0;"HERE IS MY W
HOLE FLEET";
9080 FOR A=1 TO 10
9090 FOR B=1 TO 10
9100 PRINT AT 2+A,19+B;H$(A,B);
9110 NEXT B
9120 NEXT A
9300 RETURN
```



On the side

A short utility allowing you to print sideways, courtesy of James Southgate of Colchester.



This program will run on a 16K or 48K ZX Spectrum with a printer attached. The listing first creates the user-defined characters, turns them sideways, enlarges them and then prints them up on the printer. You can then print up messages many metres long, occupying the full width of the printer paper.

Best of three

The program is divided into three sections. The first section, comprising lines 150 to 300, reads the decimal numbers which make up the user-defined characters and converts them into binary numbers. Lines 170 to 190 check that the message entered contains the user-defined graphics characters. The second section, lines 320 to 410, turn the characters on their side.

The final section, contained in lines 430 to 500, takes the sideways characters, enlarges them and sends them to the printer.

This version of the program only accepts user-defined characters of A to U, plus the facility of being able to use spaces. Should you wish to use the remaining letters of the alphabet or symbols of your own choice, then you will have to define them yourself — see chapter 14 of the Sinclair Spectrum manual — and then load this program. You should, however, be able to construct a wide variety of messages with the letters already defined in the program given.

In use

To use the program, enter it, SAVE it to tape and then RUN it. Now input your message — your message may be of any length, but remember that as well as taking time to print out, you will also use a lot of printer paper so make sure your message is spelt correctly! Characters may be used more than once within the same message. Once the printout has been completed, RUN the program again and enter the next message you wish to be printed out.

The listing provided shows the complete program. However, if you wish to.utilise parts of the program for use in other listings, lines 150 to 300 could be modified to form a decimal to binary convertor program. Also, lines 100 to 410 could be used to turn user-defined characters sideways, retaining their original size, for inclusion in your own programs to improve presentation in some way.

To find the binary numbers which make up the sideways characters, you can delete lines 430 to 500 and add the lines shown in Fig. 1.

```
 150 DIM a(8): LET a(1)=128: LET
 a(2)=64: LET a(3)=32: LET a(4)=
16: LET a(5)=8: LET a(6)=4: LET
a(7)=2: LET a(8)=1
 160 INPUT "ENTER MESSAGE > ";a$
 170 FOR s=1 TO LEN a$: IF a$(s)
=" " THEN GO TO 190
 180 IF CODE a$(s)<65 OR CODE a$
(s)<97 AND CODE a$(s)>85 OR CODE
 a$(s)>117 AND CODE a$(s)<144 OR
CODE a$(s)>164 THEN PRINT a$(s)
;" ISN'T A USER GRAPHIC CHARACTE
R": BEEP 1,-20: STOP
 190 NEXT s
 200 FOR p=1 TO LEN a$
 210 IF a$(p)=" " THEN CLS : COP
Y : GO TO 490
 220 LET y=USR a$(p)
 230 DIM b$(8,8)
 240 FOR i=0 TO 7
 250 LET b$(i+1)="00000000"
 260 LET x=PEEK (y+i)
 270 FOR n=1 TO 8
 280 IF x>=a(n) THEN LET b$(i+1,
n)="1": LET x=x-a(n)
 290 NEXT n
 300 NEXT i
 310 REM
 320 REM *TURN LETTER SIDEWAYS*
 330 REM
 340 DIM e$(8,8)
 350 LET k=1
 360 FOR i=1 TO 8
 370 LET f$=""
 380 FOR n=8 TO 1 STEP -1
 390 LET f$=f$+b$(n,k): NEXT n
 400 LET e$(i)=f$
 410 LET k=k+1: NEXT i
 420 REM
 430 REM **PRINT LARGE LETTERS**
 440 REM
 450 FOR i=1 TO 8
 460 LET c$="": FOR n=1 TO 8
 470 LET c$=c$+("   " AND e$(i,
n)="0")+("███" AND e$(i,n)="1")
 480 NEXT n: LPRINT c$'c$'c$: NE
XT i
 490 NEXT p
 500 BEEP 1,20: STOP
```

The main part of the BASIC listing.

```
 430>FOR n=1 TO 8: PRINT "BIN ";
e$(n): NEXT n
 440 PRINT : NEXT p
 450 STOP
```

Fig. 1. If you want to find the binary numbers which make up the sideways characters, delete lines 430 to 500 and insert the above.

Educating, Peter?

Peter Shaw takes a look at some educational software packages for the Spectrum.

It was only a few months ago that I heard someone say 'There's a big gap in the software market for Educational tapes.' Looking around now, there seems to be an ever growing collection of companies writing pre-school and school age software.

Here are a selection of some of the software packages available.

Adding And Subtracting 16/48K Spectrum Widget Programmes

The three programs on this tape are brilliant. Great use of machine code and Hi-res graphics.

In 'Adding', you count the number of blocks put onto the two wagons of a train, then you add them together. If you get your sums right, the train moves off in a Hi-res scroll, puffing smoke as it goes. 'Subtracting' shows you a graphical picture of a port. You then type in the number of crates you can see on the boat. If you get this right, a little man runs down and takes some of the crates off – you then type in the number he has taken off followed by the number left.

'Ducks', the last program on the tape, is a combination of addition and subtraction. My favourite educational tape!

Counting
16/48K Spectrum
Widget Programmes

Widget have gone into educational software in a big way – they have bright, colourful inserts and simple instructions with every tape.

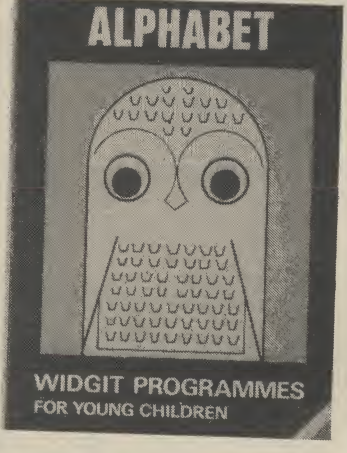
Counting includes four programs: 'Count', where you must count the number of monsters on the screen; 'Count Cats', in which you have to decide how many of one object are scattered amongst the other things; 'Rockets', where you have to count the number of spacemen in the rockets; and lastly, 'Count 100', where you must count the number of men (who sometimes stroll onto the screen), up to a maximum of 100.

All four programs are well-written, bug free and worth a look.

Shape Sorter
16/48K Spectrum
Widget Programmes

The three programs on this tape include 'Shape Sort', 'Houses' and 'Size Sort'.

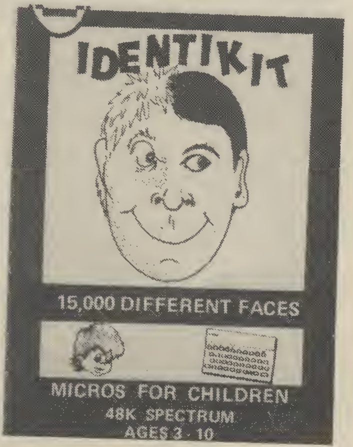
'Shape Sort' and 'Size Sort' are just what the name implies. 'Houses' is a 'spot the difference' game. On level two it gets pretty difficult. Again, great use of colour and graphics.



Alphabet
48K Spectrum
Widget Programmes

This program is similar to the books which have a different picture for every letter. The program also has a lower case training mode which draws a lower case letter on the screen (pretty big), then draws the shape to go with it.

I'm surprised they found room for this program in 48K!



Identikit
48K Spectrum
Stell Software

This reminds me a great deal of the VIC 20 program, 'Facemaker'. You can choose the hair type, eyes, nose, mouth and ears then, as an extra feature, waggle parts of the face.

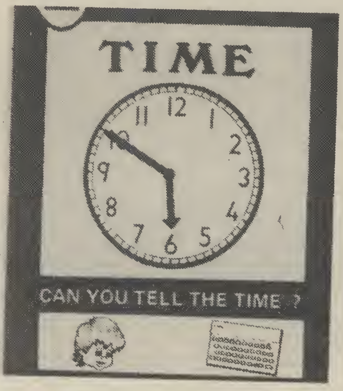
There is superb use of colour graphics in this program, as well as a good sprinkling of machine code.

Time
48K Spectrum
Stell Software

This program displays a large graphic clock, and then says 'Stop the clock at . . . o'clock'. It takes quite a while for the hands to get around to the precise time, so your pupil may lose interest in the program.

There are many variations including a section which teaches 'minutes past', etc.

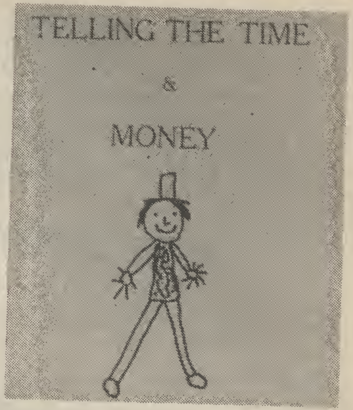
Not a bad package, but perhaps a little bit slow.



Eiffel Tower
48K Spectrum
Chalksoft

Unfortunately, my review copy constantly crashed. This may have been because I had Microdrives attached, or because it was a bad tape. What I do know about the program is that it is a variation on 'French hangman' where you must translate between English and French to build the Eiffel Tower.

Definitely one of the more fun ways to learn the French language!



Telling The Time & Money
16K Spectrum
Poppy programs

In 'Telling The Time', you have to write the time displayed in words, ie ten past six or twenty to five. Unfortunately, the program is painfully slow, and even Time (Stell) is faster.

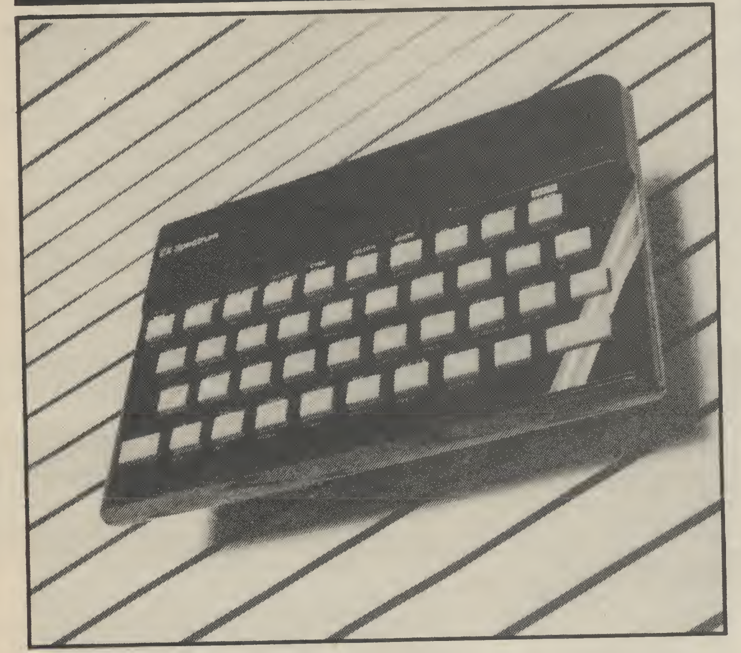
'Money' fairs better. You are shown the coins you can choose from and you are told to give the computer a certain amount. Pressing the corresponding keys will make the coins (or notes) appear further down the screen, and are added to your running total. If you give the computer the right money the sums seem to get harder.

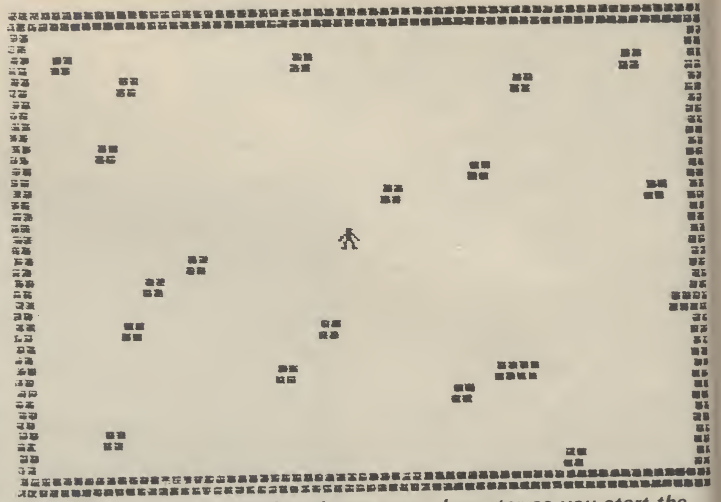
I liked 'Money', but I must say that 'Telling the time' was a bit of a disappointment.

Program name	Price	Company	Address	Marks out of 10
Counting	£5.00	Widget, 48 Durham Road, London N2		8
Adding & Subtracting	£5.00	Widget, 48 Durham Road, London N2		10
Shape Sorter	£5.00	Widget, 48 Durham Road, London N2		8
Alphabet	£5.00	Widget, 48 Durham Road, London N2		9
Time	£5.00	Stell, 36 Limefield Avenue, Whalley, Lancs BB6 9RJ		6
Identikit	£5.00	Stell, 36 Limefield Avenue, Whalley, Lancs BB6 9RJ		9
Eiffel Tower	£5.00	Chalksoft, Lowmoor Cottage, Tonedale, Wellington, Somerset TA21		6
Telling Time/ Money	£5.50	Poppy Programs, c/o Vera Sampson, Richmond House, Ingleton, Carnforth, Lancs LA6 3AN		7

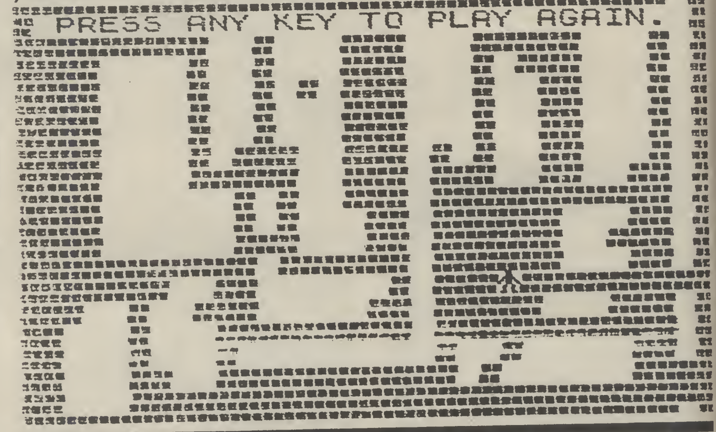
Off the wall

An interesting variation on the 'maze' theme from C Elliston of Suffolk.





The above screen illustration shows your character as you start the game; the second illustration below shows how easy it is to get yourself blocked in!



PRESS ANY KEY TO PLAY AGAIN.

This is a simple game for your ZX Spectrum — simple, but extremely difficult to play!

You control the flow of bricks around the playing area of the screen using the four direction keys on the Spectrum. The stream of bricks can only be stopped if you run into another wall or you change direction.

The idea of the game is to manoeuver the stream of bricks, which leaves a wall behind it, trying not to 'box' yourself in. However, it's not as easy as you might first think as there are a random number of bricks scattered throughout the playing area which get in your way.

You score points while you keep the stream of bricks in motion, and if you manage to surpass a score of 80, you qualify for another screenfull. Of course, this time it gets more difficult as there are more random bricks scattered about. The top score so far is 513 — see if you can beat it!

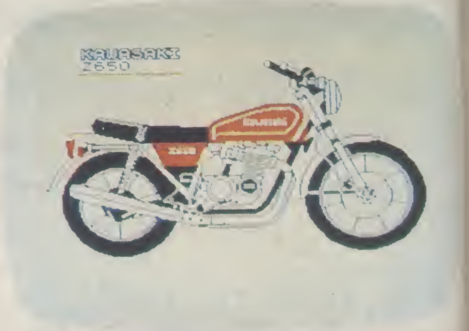
If you're looking for one word to describe this game, try 'addictive' — type it in and you'll see what I mean.

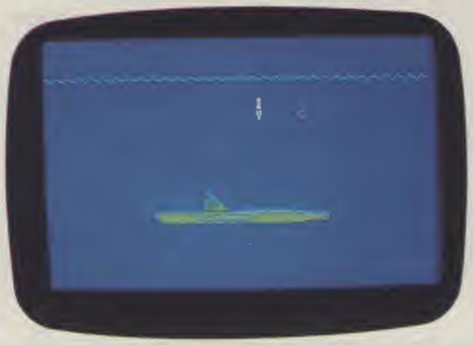
Line by line

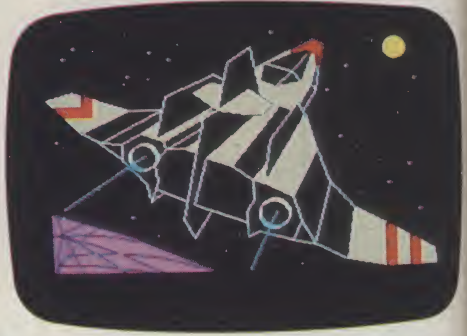
Here follows a breakdown of the listing with a suggestion for changing the game a little to suit your own requirements:

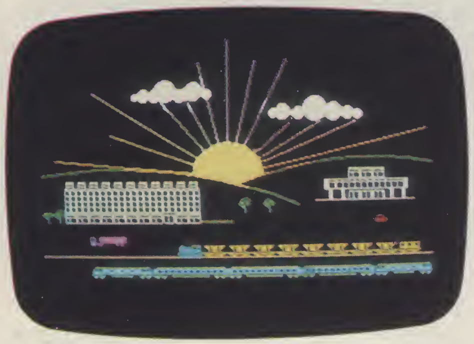
Lines 11-14	Set up the user-defined graphics.
Lines 32-36	Print the border walls.
Line 38	Prints the score on the border wall.
Lines 40-50	Print the random bricks in the playing area.
Lines 100-5000	Contain the main games loop.
Line 455	Tests to see if you are 'boxed' in.
Lines 5000-6000	Calculate the score.
Line 5025	Converts the number of bricks into a percentage of the screen covered.
Line 5053	This line can be changed to lower the score required to move on up to another screen. For example, if you wanted to get another screen after 50 points, you would have to make line 5053: 5053 IF PC>= 50
Lines 6000-7000	Contain the instructions for the game.

```
  11 FOR n=0 TO 7: READ z: POKE
USR "a"+n,z: NEXT n
  12 DATA 0,119,119,119,0,238,23
8,238
  13 FOR n=0 TO 7: READ z: POKE
USR "b"+n,z: NEXT n
  14 DATA 24,24,60,90,153,36,36,
102
  15 GO SUB 6000
  16 LET hi=0: LET fr=0
  17 LET h=20
  18 LET score=0
  20 LET x=10: LET y=15
  30 LET a$="A"
  32 PRINT BRIGHT 1; PAPER 7; IN
K 2;AT 0,0;"AAAAAAAAAAAAAAAAAA
AAAAAAAAAAA"
  33 FOR n=1 TO 20
  34 PRINT BRIGHT 1; PAPER 7; IN
K 2;AT n,0;"A";AT n,31;"A"
  35 NEXT n
  36 PRINT BRIGHT 1; PAPER 7; IN
K 2;AT 21,0;"AAAAAAAAAAAAAAAAAA
AAAAAAAAAAAA"
  38 PRINT #1; PAPER 1; INK 7;AT
 0,1;"SCORE=";AT 0,15;"HI SCORE=
"
  40 FOR b=1 TO h
  45 LET c=INT (RND*20)+1
  46 IF c=10 THEN GO TO 45
  47 LET d=INT (RND*30)+1
  48 IF ATTR (c,d)>100 THEN GO T
O 45
  49 BEEP .01,d
  50 PRINT PAPER 7; INK 2; BRIGH
T 1;AT c,d;a$: NEXT b
  55 FOR n=-20 TO 20: BEEP .01,A
BS n+15: NEXT n
  60 PRINT AT x,y;"B"
  80 PAUSE 0
 100 IF INKEY$="5" THEN GO TO 10
00
 200 IF INKEY$="6" THEN GO TO 20
00
 300 IF INKEY$="7" THEN GO TO 30
00
 400 IF INKEY$="8" THEN GO TO 40
00
 450 PRINT AT x,y;"B"
 455 IF ATTR (x+1,y)>32 AND ATTR
 (x-1,y)>32 AND ATTR (x,y+1)>32
AND ATTR (x,y-1)>32 THEN GO TO 5
000
 500 GO TO 100
1000 REM ++++++++LEFT++++++++
1010 IF ATTR (x,y-1)>32 THEN GO
TO 100
1020 PRINT PAPER 7; INK 2; BRIGH
T 1;AT x,y;"A"
1025 PRINT #1; PAPER 1; INK 7;AT
 0,7;INT ((score*100)/(599-h))+f
r
1030 LET y=y-1
1035 IF y<=0 THEN LET y=0
1040 PRINT AT x,y;"B"
1050 BEEP .01,21-x
1055 LET score=score+1
1060 IF INKEY$="6" THEN GO TO 20
00
1070 IF INKEY$="7" THEN GO TO 30
00
1090 GO TO 1000
2000 REM ++++++++DOWN++++++++
2010 IF ATTR (x+1,y)>32 THEN GO
TO 100
2020 PRINT PAPER 7; INK 2; BRIGH
T 1;AT x,y;"A"
2025 PRINT #1; PAPER 1; INK 7;AT
 0,7;INT ((score*100)/(599-h))+f
r
2030 LET x=x+1
2035 IF x>=21 THEN LET x=21
2040 PRINT AT x,y;"B"
2050 BEEP .01,21-x
2055 LET score=score+1
2060 IF INKEY$="5" THEN GO TO 10
00
2080 IF INKEY$="8" THEN GO TO 40
00
2090 GO TO 2000
3000 REM +++++++++UP+++++++++
3010 IF ATTR (x-1,y)>32 THEN GO
TO 100
3020 PRINT PAPER 7; INK 2; BRIGH
T 1;AT x,y;"A"
3025 PRINT #1; PAPER 1; INK 7;AT
 0,7;INT ((score*100)/(599-h))+f
r
3030 LET x=x-1
3035 IF x<=0 THEN LET x=0
3040 PRINT AT x,y;"B"
3050 BEEP .01,21-x
3055 LET score=score+1
3060 IF INKEY$="5" THEN GO TO 10
00
3080 IF INKEY$="8" THEN GO TO 40
00
3090 GO TO 3000
4000 REM +++++++++RIGHT+++++++
4010 IF ATTR (x,y+1)>32 THEN GO
TO 100
4020 PRINT PAPER 7; INK 2; BRIGH
T 1;AT x,y;"A"
4025 PRINT #1; PAPER 1; INK 7;AT
 0,7;INT ((score*100)/(599-h))+f
r
4030 LET y=y+1
4035 IF y>=31 THEN LET y=31
4040 PRINT AT x,y;"B"
4050 BEEP .01,21-x
4055 LET score=score+1
4070 IF INKEY$="6" THEN GO TO 20
00
4080 IF INKEY$="7" THEN GO TO 30
00
4090 GO TO 4000
5000 REM ++++++++++++SCORE++++++
5025 LET pc=INT ((score*100)/(59
9-h))
5030 LET fr=fr+pc
5035 IF fr>hi THEN LET hi=fr
5050 PRINT #1; PAPER 1; INK 7;AT
 0,1;"SCORE=";INT pc;" ";AT 0,15
;"HI SCORE=";hi;" "
5053 IF pc>=80 THEN GO TO 5060
5054 LET fr=0: LET pc=0: LET h=2
0
5055 PRINT PAPER 6; INK 0; FLASH
 1;AT 2,1;" PRESS ANY KEY TO PLA
Y AGAIN. "
5059 GO TO 5069
5060 LET pc=0: LET h=h+10
5063 PRINT FLASH 1; PAPER 6; INK
 0;AT 2,3;" Press key for next r
ound "
5069 PAUSE 0
5070 FOR n=1 TO 20
5080 PRINT PAPER 4;AT n,1;"
                              ": BEEP
 .01,n
5090 NEXT n
5093 PRINT #1; PAPER 1; INK 7;AT
 0,7;fr;" "
5095 GO TO 18
6000 REM ++++++++++++INSTR+++++
6010 BORDER 6: PAPER 4: CLS
6015 DRAW 255,0: DRAW 0,175: DRA
W -255,0: DRAW 0,-175
6020 FOR n=1 TO 9
6030 PRINT PAPER 7; INK 2; BRIGH
T 1;AT n,1;"AAAAAAAAAAAAAAAAAAAA
AAAAAAAAAA"
6040 NEXT n
6050 PRINT PAPER 7; INK 2; BRIGH
T 1;AT 10,1;"A
          A"
6060 FOR n=11 TO 20
6070 PRINT PAPER 7; INK 2; BRIGH
T 1;AT n,1;"AAAAAAAAAAAAAAAAAAAA
AAAAAAAAAA"
6080 NEXT n
6090 LET a$="
      BRICK-YARD BILL
HELP BILL STACK THE BRICKS BUT B
E CAREFUL NOT TO GET TRAPPED
                     BAAAAAAAAAAA

AAAAAAAAAAAAAAAAA"
6095 FOR n=0 TO 135
6100 LET a$=a$(2 TO )+a$(1)
6110 BEEP .05,CODE a$(28)/4
6120 PRINT PAPER 7; INK 2; BRIGH
T 1;AT 10,2;a$(1 TO 28)
6130 NEXT n
6134 PRINT BRIGHT 1; PAPER 1; IN
K 7;AT 10,5;"press key to contin
ue"
6135 PAUSE 0
6140 PAPER 4: CLS
6150 PRINT PAPER 4; INK 0;AT 2,2
;"USE THE CURSOR KEYS TO STEER
  BILL AROUND THE BRICK-YARD."
6160 PRINT PAPER 4; INK 0;AT 6;2
;"AT THE END OF EACH GAME YOU
  WILL BE GIVEN THE APPROX
  PERCENTAGE OF THE YARD WHICH
  IS COVERED WITH BRICKS."
6170 PRINT PAPER 4; INK 0; BRIGH
T 1;AT 15,4;"PRESS ANY KEY TO ST
ART."
6175 DRAW 255,0: DRAW 0,175: DRA
W -255,0: DRAW 0,-175
6180 PAUSE 0
6190 FOR n=0 TO 40 STEP 5
5200 BEEP .03,n
6210 NEXT n
6220 CLS
7000 RETURN
```









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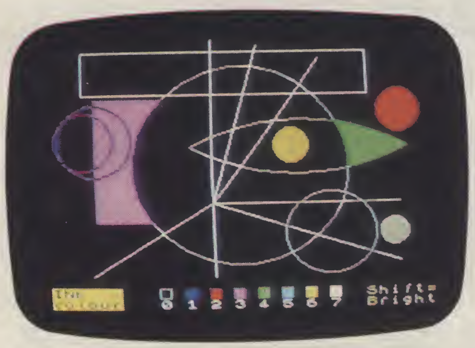
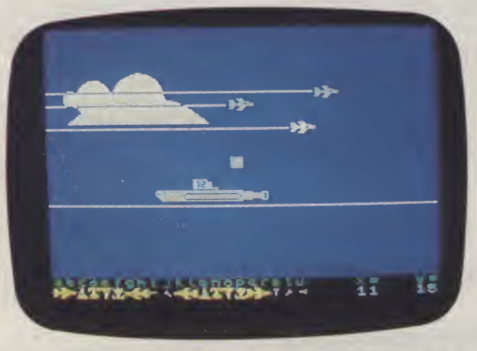
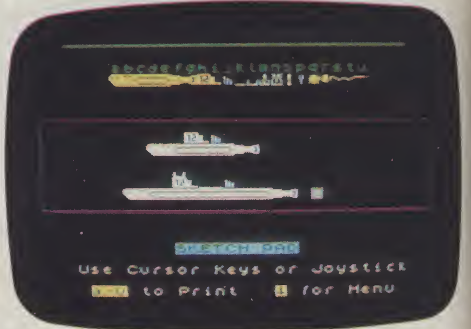
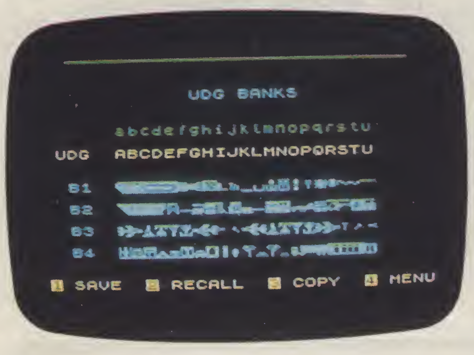
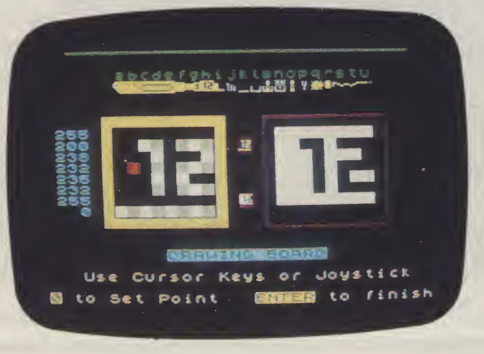




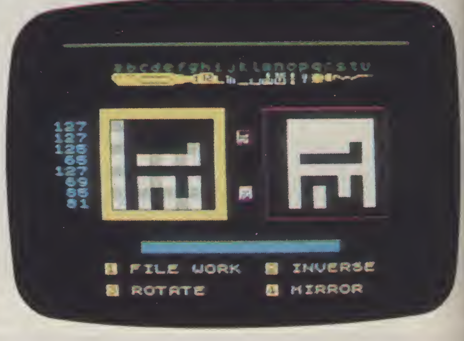


Use Cursor Keys or Joystick
to Print for Menu





Use Cursor Keys or Joystick
to Set Point ENTER to finish



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Hell's angels

Can you save the Earth from impending doom in this program written for us by Akram Malik of Eltham.

In this program, it is your unenviable task to once again defend the Earth from the alien hordes — this time in the shape of angels from Hell and then by a number of demons.

The first wave of aliens are called Hell's angels and are capable of great destruction should they be allowed to pass through your defences. Indeed, should you let more than five of the angels passed, you will find that your mission has failed and Earth will be destroyed. You must shoot 20 of these angelic upstarts before you get through to the next stage of the game where you will meet the fully fledged demons.

Demonic danger

The demons are, of course, much more powerful than the Hell's angels and your task is once again to stop them piercing your defences. However, this time, if you only let two through then Earth will be considered destroyed. Still, if you've managed to get through to this stage of the game you will no doubt have your alien-shooting eye targeted in on the aliens. If you manage to shoot 20 of the demons out of the sky, you can congratulate yourself on having saved the Earth.

Care must be taken to make sure your aim is true before you shoot at the aliens as you have 100 laser points to destroy the invasion force. Obviously, if the Earth is destroyed the game ends with a message informing you of the sad fate of humankind.

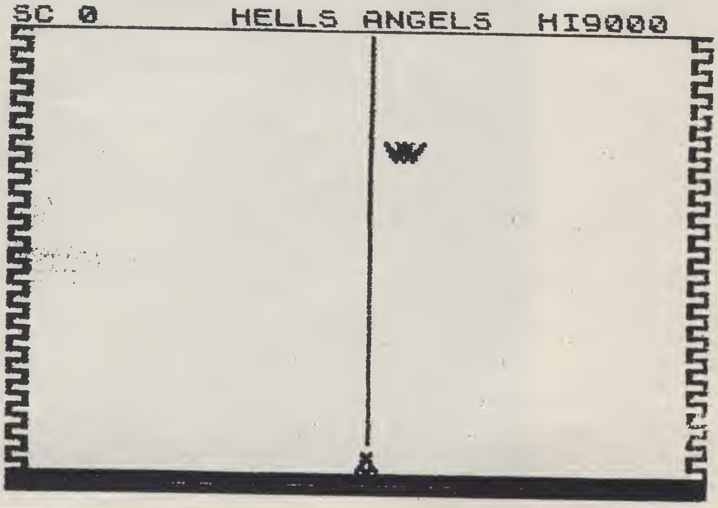
The controls used in the game are keys '1' to '5' to move right, keys '6' to '0' to move left and any key on the bottom row to fire your laser.

```
   1 GO SUB 4000
   2 LET hi=0
   5 LET sc=0
   6 LET an=20: GO SUB 1000
  10 BORDER 1: PAPER 5: INK 2: C
LS
  20 FOR g=1 TO 21: PRINT AT g,0
;"A";AT g,31;"A": NEXT g
  30 FOR h=0 TO 7: PLOT 0,h. DRA
W INK 3;255,0: NEXT h
  40 PLOT 0,167: DRAW 255,0
  50 PRINT AT 0,0; INK 3;"SC ";s
c;TAB 10; INK 2;"HELLS ANGELS";T
AB 24; INK 0;"HI";hi
  60 LET lp=100: LET at=5: LET c
=16: LET a$="BC"
  70 LET i=2: LET q=INT (RND*17)
+5
  75 IF an=0 THEN GO TO 1310
  80 PRINT INK 0;AT i,q;a$
  90 PRINT AT 20,c;" "
  95 IF i=20 THEN GO TO 270
 100 LET c=c+(IN 61438<>255 AND
c<30)-(IN 63486<>255 AND c>1)
 110 PRINT AT 20,c; INK 2;"D"
 120 PRINT OVER 1; INK 0;AT i,q;
a$
 125 LET i=i+1
 130 LET q=q+INT (RND*3)-1+(3 AN
D q<-30)-(3 AND q>30)
 140 PRINT OVER 1; INK 0;AT i,q;
a$: BEEP .01,12
 155 IF i=20 AND (q=c OR q+1=c)
THEN PRINT AT i,c-1;"EEE": PRINT
 INK 2;AT 10,3;"You "; INK 3;"ha
ve "; INK 0;"been "; INK 2; FLAS
H 1;"DESTROYED!": BEEP 2,5: BEEP
 1,10: PAUSE 150: GO TO 300
 160 IF (IN 65278<>255 OR IN 327
65<>255) THEN GO SUB 200: LET lp
=lp-1
 165 IF lp=0 THEN GO TO 6000
 170 GO TO 80
 200 PLOT INVERSE 1;c*8+4,17: DR
AW INK INT (RND*3);0,148: BEEP .
06,16: PLOT INVERSE 1;c*8+4,17:
DRAW OVER 1;0,148
 220 IF (i>2 AND i<20) AND (q=c
OR q+1=c) THEN LET sc=sc+500: PR
INT AT 0,3; INK 3;sc: BEEP .08,5
: PRINT INK INT (RND*3);AT i,c-1
;"EEE": BEEP .02,15: PRINT AT i,
c-1;"   ": LET an=an-1: GO TO 70
 250 RETURN
 270 PRINT AT 20,q;"  ": LET sc=
sc-200: IF sc<0 THEN PRINT INK 3
;AT 0,2;sc
 275 IF sc>0 THEN PRINT INK 3;AT
 0,0;"SC ";sc: PRINT AT 0,2;" "
 277 IF sc<1000 THEN PRINT AT 0,
6;"  "
 280 LET at=at-1: IF at>0 THEN G
O TO 70
 285 PRINT INK 2; FLASH 1;AT 10,
2;"FOOL!"; INK 1; FLASH 0;"You l
et "; INK 3;"5 thru!"
```

```
 290 BEEP .5,10: BEEP 1,-30: BEE
P 2,20: BEEP 3,0
 310 IF sc>hi THEN LET hi=sc
 320 BORDER 3: PAPER 7: INK 3: C
LS
 330 FOR h=0 TO 40 STEP 8: FOR t
=40 TO 0 STEP -10: BEEP .07,h: B
EEP .04,t: NEXT t: NEXT h
 340 PRINT AT 1,10; FLASH 1;"GAM
E OVER";AT 3,1; FLASH 0;"Earth w
ill now be destroyed.";AT 10,5;"
Your score was:";sc;AT 12,5;"Hig
h score is :";hi
 350 PAUSE 300: GO TO 5
1000 BORDER 1: PAPER 1: INK 7: C
LS

1010 PRINT AT 0,10;"HELLS ANGELS
"; OVER 1;AT 0,10;"            "
;AT 4,3;"Keys 1 TO 5-move right"
;AT 6,3;"Keys 6 TO 0-move left";
AT 8,3;"Bottom row keys-fire";AT
 14,2;"Press any key to start"
1100 PAUSE 500: RETURN
1310 FOR y=0 TO 20 STEP 2: BEEP
.08,y: BEEP .2,5: NEXT y
1315 BORDER 2: PAPER 1: INK 7: C
LS
1317 PRINT AT 11,12;"STAGE 2": P
AUSE 50: CLS
1319 FOR r=1 TO 21: PRINT AT r,0
;"F";AT r,31;"F": NEXT r
1320 FOR w=0 TO 7: PLOT 0,w: DRA
W INK 4;255,0: NEXT w
1324 PLOT 0,167: DRAW 255,0
1329 PRINT AT 0,0; INK 6;"SC ";s
c;TAB 10; INK 5;"HELLS ANGELS";T
AB 24; INK 4;"HI";hi
1330 LET at=2: LET c=16: LET al=
20
1335 LET i=2: LET q=INT (RND*17)
+5
1340 IF al=0 THEN GO TO 2000
1380 PRINT INK 6;AT i,q;"G"
1390 PRINT AT 20,c;" "
1395 IF i=20 THEN GO TO 1570
1400 LET c=c+(IN 61438<>255 AND
c<30)-(IN 63486<>255 AND c>1)
1410 PRINT AT 20,c; INK 5; BRIGH
T 1;"H"
1420 PRINT OVER 1; INK 6;AT i,q;
"G"
1425 LET i=i+1
1430 LET q=q+INT (RND*3)-1+(3 AN
D q<-30)-(3 AND q>30)
1440 PRINT OVER 1; INK 6;AT i,q;
"G": BEEP .01,15
1450 IF i=20 AND q=c THEN PRINT
AT i,c; INK (RND*3)+4;"E": PRINT
 INK 2;AT 10,2;"Oh dear!"; INK 3
;"what a "; INK 2; FLASH 1;"MESS
!": BEEP 3,5: BEEP 3,15: PAUSE 5
0: GO TO 1600
1460 IF (IN 65278<>255 OR IN 327
66<>255) THEN GO SUB 1500: LET l
p=lp-1
1465 IF lp=0 THEN GO TO 6000
1470 GO TO 1380
1500 PLOT INVERSE 1;c*8+4,17: DR
AW INK (RND*3)+4;0,148: BEEP .06
,12: PLOT INVERSE 1;c*8+4,17: DR
AW OVER 1;0,148
1520 IF (i>2 AND i<20) AND q=c T
HEN LET sc=sc+500: PRINT AT 0,3;
 INK 6;sc: BEEP .04,10: PRINT IN
K 6;AT i,c;"E": BEEP .08,2: PRIN
T AT i,c;" ": LET al=al-1: GO TO
 1335
1550 RETURN
1570 PRINT AT 20,q;" ": LET sc=s
c-200: IF sc<0 THEN PRINT AT 0,2
; INK 6;sc
1575 IF sc>0 THEN PRINT AT 0,2;"
": LET at=at-1: IF at>0 THEN GO
 TO 1335
1585 PRINT INK 4; FLASH 1;AT 10,
3;"IDIOT!"; INK 5; FLASH 0;"You
let "; INK 6;"2 thru!"
1595 BEEP .8,10: BEEP 1,4: BEEP
2,-10: BEEP 1,18: BEEP 1,-20
1600 GO TO 300
2000 BEEP .08,19: BEEP .2,10: BE
EP .15,15: BEEP .4,25: FOR w=0 T
O 20 STEP 2: BEEP .1,w: BEEP .05
,4: NEXT w: BEEP .4,25: BEEP .15
,15: BEEP .2,10: BEEP .8,15: BEE
P .1,8: BEEP 2,3
2010 BORDER 6: PAPER 6: INK 0: C
LS
2020 PRINT AT 10,4; FLASH 1;"You
 have saved Earth!";AT 14,6;"CON
GRATULATIONS!"
2030 PRINT AT 18,4; FLASH 0;"Pre
ss a key to play again"
2040 PAUSE 500: IF INKEY$="" THE
N STOP
2050 GO TO 2
4000 FOR n=0 TO 7
4100 READ A: POKE USR "A"+n,A: N
EXT n
4110 DATA 255,255,192,192,255,25
5,3,3
4200 FOR n=0 TO 7: READ B: POKE
USR "B"+n,B: NEXT n
4210 DATA 68,99,50,59,31,31,13,4
4300 FOR n=0 TO 7: READ C: POKE
USR "C"+n,C: NEXT n
4310 DATA 145,227,166,238,252,12
0,88,144
4400 FOR n=0 TO 7: READ D: POKE
USR "D"+n,D: NEXT n
4410 DATA 36,60,24,60,36,102,255
,153
4500 FOR n=0 TO 7: READ E: POKE
USR "E"+n,E: NEXT n
4510 DATA 153,0,36,0,219,0,92,12
9
4600 FOR n=0 TO 7: READ F: POKE
USR "F"+n,F: NEXT n
4610 DATA 219,102,219,102,219,10
2,219,102
4700 FOR n=0 TO 7: READ G: POKE
USR "G"+n,G: NEXT n
4710 DATA 153,126,90,126,60,36,2
4,24
4800 FOR n=0 TO 7: READ H: POKE
USR "H"+n,H: NEXT n
4810 DATA 102,36,36,60,102,231,1
89,231
5000 RETURN
6000 PRINT INK 2;AT 10,1;"You ra
n out of laser power!": BEEP 5,-
30: GO TO 300
```

A sample screen illustration from the program, Hell's angels.



```
SC 0          HELLS ANGELS  HI9000
```

PLAY T

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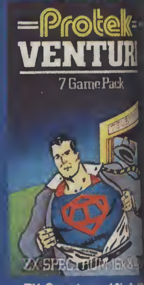

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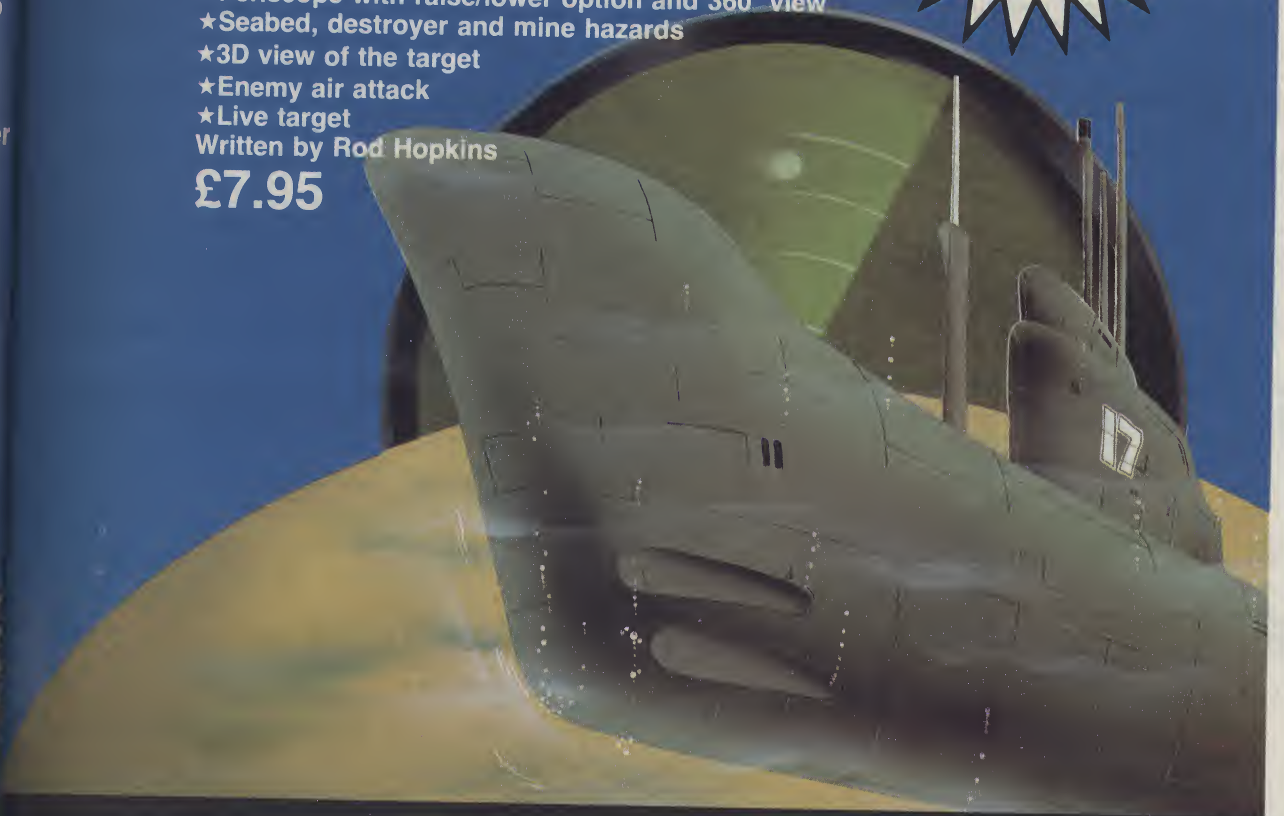

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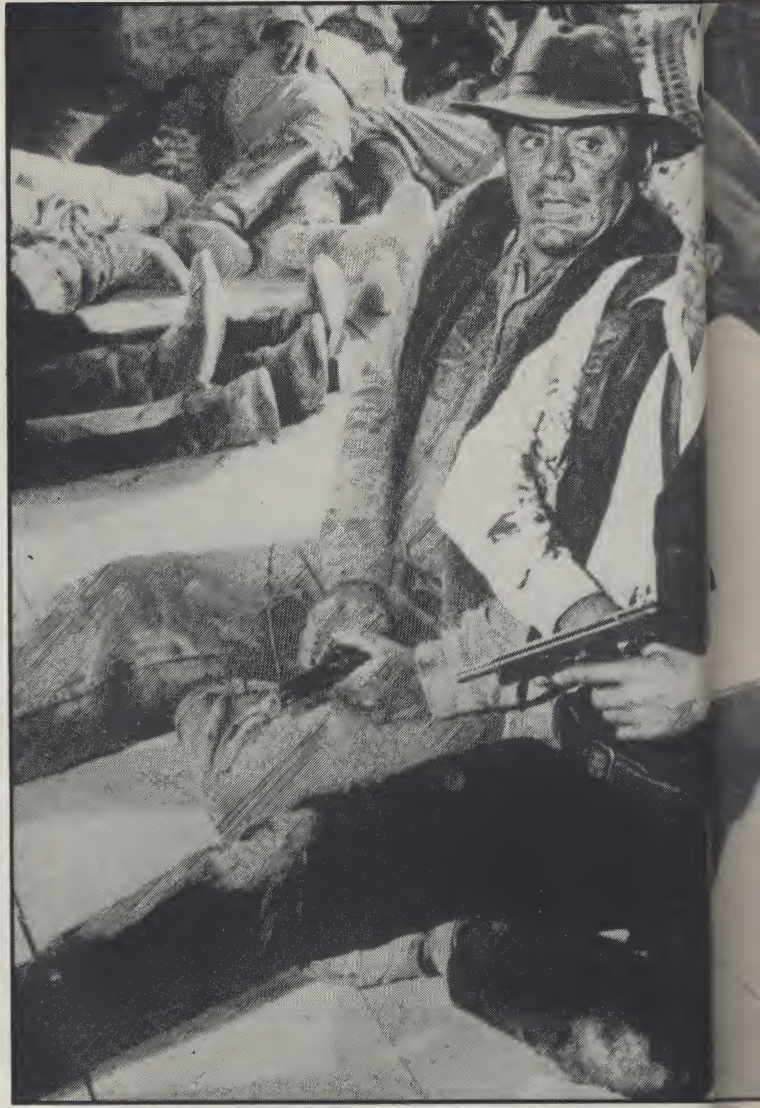
Wild west

Holster up and get ready to play this Spectrum version of the arcade game from R Page of Liverpool.



Based on the popular arcade game, this program is designed to be played by two people. Both players have control of a cowboy character, each equipped with a handgun.

Each character is placed to the left and right of the screen display. A road runs down the middle of the screen, on which the occasional wagon will roll into the distance. Beside the road are a number of cactii which, along with the moving wagon, provide cover for the two cowboy characters as they stalk their opposition trying to get a shot at each other.

Go for your guns

Each cowboy character can be manipulated around their own half of the screen through the four direction keys. There is also a key to fire your gun, which you press when you think you have a clear view of the other cowboy. All instructions are provided on screen as part of the program.

You will find, however, that your shots will not travel the entire width of the screen, so there's no use you hanging back hoping the other cowboy will come out into the open and give you a clear shot — this is no game for cowards!

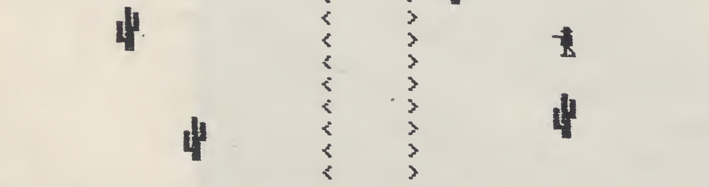
As I have said, your character will not cross the road which bisects the screen display. However, should you wish to change this, allowing your characters to wander all over the screen, you can always try experimenting with the values of A, B, C and D in lines 620, 625 and 710.

To win the game, you must get five clear shots at your opponent. Once the game is over, the winner's name will be displayed along with the option to have another game.

Line by line

The program is structured in the following way:

Lines 10-50	Fire a bullet and detect if one of the characters has been hit.
Lines 90-200	Provide the instructions for the game.
Lines 530-600	Set up the screen display.
Lines 610-760	Detect the winner and also contain the main routine for the game.
Lines 770-830	Set up the user-defined graphics and variables used in the game.



A screen illustration from the program, Wild west.

```
   3 GO TO 90
   5 REM FIRE AND CHECK FOR HIT
  10 FOR R=(B+2) TO (B+18)
  15 IF SCREEN$ (C,D)="." THEN G
O TO 50
  16 IF ATTR (A,R)=39 OR ATTR (A
,R)=33 THEN PRINT AT A,R-1;" ":
GO TO 650
  17 PRINT AT A,R-1;" ";AT A,R;
INK 7;".": NEXT R: PRINT AT A,R-
1;" ": GO TO 650
  20 RETURN
  25 FOR R=(D-1) TO (D-18) STEP
-1
  30 IF SCREEN$ (A,B)="." THEN G
O TO 40
  33 IF ATTR (C,R-1)=39 OR ATTR
(C,R-1)=33 THEN PRINT AT C,R;" "
: GO TO 730
  35 PRINT AT C,R;" ";AT C,R-1;
INK 7;".": NEXT R: PRINT AT C,R;
" ": GO TO 730
  40 PRINT AT a,b;"IJ";AT a+1,b;
" ": LET S2=S2+1: BEEP .2,20: BE
EP .2,10: BEEP .2,15: PRINT INK
7; PAPER 0;AT 0,31;S2: PRINT AT
a,b;" ";AT a,b+1;" ": GO TO 730
  50 PRINT AT c,d;"KL";AT c+1,d;
" ": LET S1=S1+1: BEEP .2,20: BE
EP .2,10: BEEP .2,15: PRINT INK
7; PAPER 0;AT 0,8;S1: PRINT AT c
,d;" ";AT c,d+1;" ": GO TO 650
  90 INK 2: PAPER 6: BORDER 6: C
LS
```

```
 100 PRINT "       WILD WEST SHO
OUT       "
 110 PRINT AT 2,1;"THE FIRST GUN
SLINGER TO SHOOT    HIS OPPONENT
FIVE TIMES IS THE  ONE  TO SURVI
VE THE GUNFIGHT"
 120 PRINT AT 6,12;"CONTROLS"
 130 PRINT AT 8,4;"PLAYER-1";AT
8,20;"PLAYER-2"
 135 PRINT AT 9,14;"FIRE";AT 11,
14;"2";AT 11,15;"<>";AT 11,17;"9
"
 140 PRINT AT 10,8;"UP-Q";AT 12,
5;"DOWN-1";AT 14,3;"LEFT-CAPS";A
T 16,5;"RIGHT-A"
 150 PRINT AT 10,20;"P-UP";AT 12
,20;"0-DOWN";AT 14,20;"ENTER-LEF
T";AT 16,20;"SPACE-RIGHT"
 160 PRINT : PRINT " YOU CANNOT
BE SHOT IF YOU ARE   HIDING BEHI
ND A CACTUS OR THE   WAGON ON TH
E ROAD"
 165 INPUT "PLAYER ONES NAME";A$
: IF A$="" THEN GO TO 165
 166 INPUT "PLAYER TWOS NAME";B$
: IF B$="" THEN GO TO 166
 170 PAUSE 50
 180 PRINT FLASH 1; PAPER 7; INK
 2;AT 21,5;"PRESS ANY KEY TO BEG
IN"

 200 PAUSE 0
 530 PAPER 4: BORDER 4: INK 0: C
LS : RESTORE : GO SUB 770: PRINT
 PAPER 7;AT 0,0;"SCORE 1= ";AT 0
,23;"SCORE 2= ";AT 0,8; OVER 1;
PAPER 7;S1;AT 0,31; PAPER 7;S2:
OVER 0
 540 FOR F=21 TO 0 STEP -1: PRIN
T AT F,14;"<";AT F,18;">": NEXT
F
 564 RESTORE 565: FOR f=1 TO 8:
READ w,x,y,z: PRINT INK 7;AT w,x
;CHR$ 148;AT y,z; INK 7;CHR$ 149
: NEXT f
 565 DATA 11,20,12,20,3,5,4,5,7,
10,8,10,17,25,18,25,2,19,3,19,18
,8,19,8,13,5,14,5,6,27,7,27
 600 FOR O=19 TO 1 STEP -.5: PRI
NT AT O+1,16;" ";AT O+2,16;" ";A
T O-1,16; INK 7;CHR$ 144: PRINT
AT O,16; INK 1;CHR$ 145
 610 PRINT OVER 1;AT A,B;CHR$ 14
6;AT A+1,B; OVER 1;CHR$ 147
 620 LET A=A+(IN 63486=190 AND A
TTR (A+2,B)=32 AND ATTR (A+2,B+1
)=32 AND A<19)-(IN 64510=190 AND
 ATTR (A-1,B)=32 AND ATTR (A-1,B
-1)=32 AND A>2)
 625 LET B=B+(IN 65022=190 AND A
TTR (A,B+2)=32 AND ATTR (A+1,B+1
)=32 AND B<12)-(IN 65278=190 AND
 ATTR (A,B-1)=32 AND ATTR (A-1,B
-1)=32 AND B>2)
 630 OUT 63486,0: OUT 64510,0: O
UT 65022,0: OUT 65278,0
 645 PRINT AT A,B;CHR$ 146;AT A+
1,B;CHR$ 147
 647 IF INKEY$="2" THEN GO TO 10
 660 PRINT AT C,D; OVER 1;CHR$ 1
50;AT C+1,D; OVER 1;CHR$ 151
 700 LET C=C+(IN 61438=190 AND A
TTR (C+2,D)=32 AND C<19)-(IN 573
42=190 AND ATTR (C-1,D)=32 AND C
>2)
 710 LET D=D-(IN 49150=190 AND A
TTR (C,D-2)=32 AND ATTR (C+1,D-1
)=32 AND D>20)+(IN 32766=190 AND
 ATTR (C,D+1)=32 AND ATTR (C-1,D
+1) AND D<30)
 720 PRINT AT C,D;CHR$ 150;AT C+
1,D;CHR$ 151
 725 IF INKEY$="9" THEN GO TO 25
 730 IF S1=5 THEN PRINT INVERSE
1;AT 11,10; PAPER 7; FLASH 1;A$;
" WINS": PAUSE 200: PRINT AT 13,
3; PAPER 7;"PRESS ANY KEY TO PLA
Y AGAIN": PAUSE 0: FLASH 0: GO T
O 530
 740 IF S2=5 THEN PRINT AT 11,10
; PAPER 7; FLASH 1;B$;" WINS": P
AUSE 200: PRINT AT 13,3; PAPER 7
;"PRESS ANY KEY TO PLAY AGAIN":
PAUSE 0: FLASH 0: GO TO 530
 750 NEXT O
 760 PRINT AT 0,16;" ";AT 1,16;"
": GO TO 600
 770 RESTORE 780: FOR N=USR "A"
TO USR "l"+7: READ A: POKE N,A:
NEXT N
 780 DATA 0,0,24,60,102,195,195,
195,195,126,189,189,255,189,129,
0
 790 DATA 48,120,48,127,120.120,
120,48,80,144,216,0,0,0,0,0
 800 DATA 24,24,27,27,27,219,219
,223,223,220,220,252,252,28,28,2
8
 810 DATA 12,30,12,254,30,30,30,
12,10,9,27,0,0,0,0,0
 815 DATA 16,16,95,255,255,95,0,
0,0,16,16,240,240,0,0,0
 817 DATA 0,8,8,15,15,0,0,0,16,1
6,250,255,255,250,0,0
 820 LET A=19: LET B=1: LET C=19
: LET D=30: LET S1=0: LET S2=0
 830 RETURN
1000 SAVE "WILD WEST!" LINE 90
```

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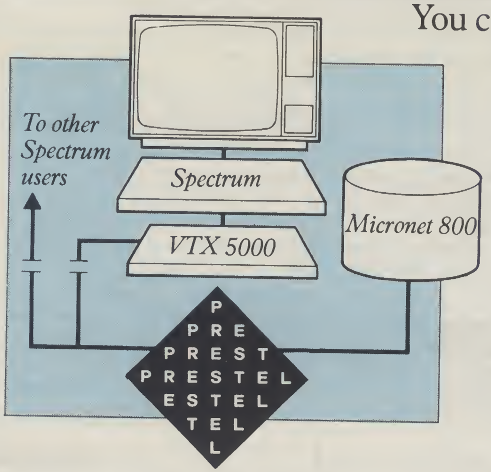

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◆ One of the many faces on Prestel

Holmes investigates

Paul Holmes inspects a number of new software packages for the ZX Spectrum.

Short Vowel Sounds — Sherston Software

Short Vowel Sounds (like the ones in cAt, hIt and pOt) are the subject of this educational cassette from Sherston Software.

The program itself is divided up into three sections which test the young child's ability to recognise an object shown on the screen and then choose the correct vowel sound from a choice (for example, cat cot cit cet cut).

In the first section, the child is only rewarded by a large tick and a bleep for the correct answer which is a little disappointing — a happy cartoon character or something of the like would be a bigger incentive to do well. The second section consists of the child having to complete a sentance, the picture on the screen indicating the correct word. Again the child chooses the correct answer from a selection of possibilities.

Overall the program is good enough for use in primary schools and reasonably priced at £7.

Firework Music — Software Cottage

This program is another educational package aimed at teaching the notes and their positions on a musical score. It is split into two programs, one for the treble clef and the other for bass.

The user is first shown where all the notes lie on the stave then has to commit them to memory for the test. It consists of a musical note being shown and the user having to name the right note before a burning cinder falls into the firework box on the screen and destroys them. The more notes that are named, the faster the cinder falls. After naming ten notes there is a mini fire work display which will probably entertain users in the younger age brackets.

The screen display of the stave, clef and notes is sufficiently large so that if it were displayed on a large TV in a classroom, the whole class would be able to see it. The program is bug free as far as I could tell, and seems a useful tool for teaching one of the more basic points of music to a fairly young age group — mainly in the Juniors and Primary school.

Overall, very good value for £5.00

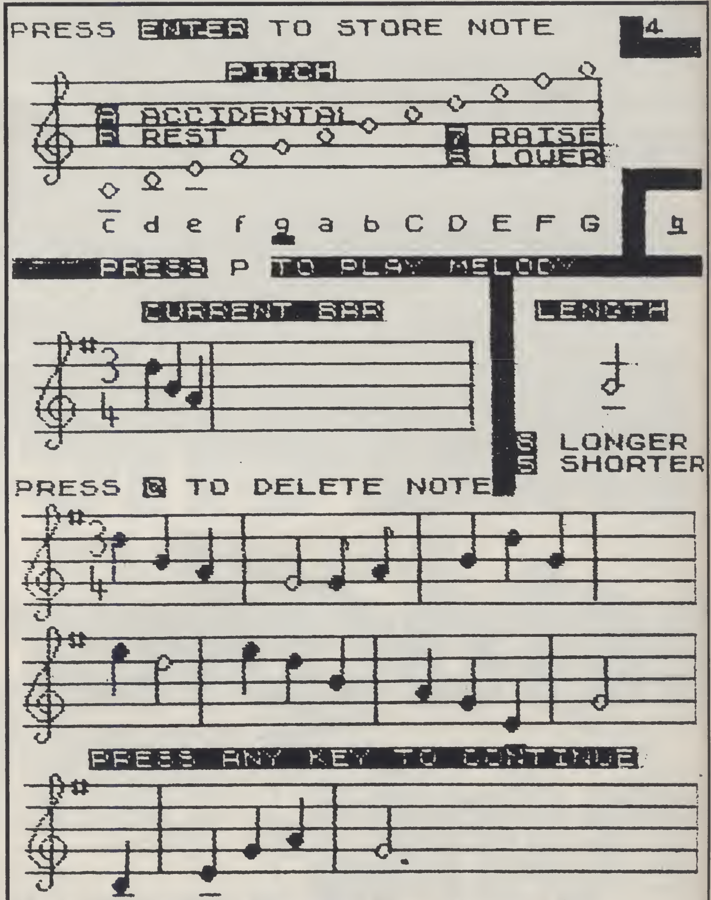
Music Maker — Bellflower Software

Being somewhat musical myself, I loaded up this program hoping to find something to lighten up my life. After choosing my key and time signatures (from eleven major keys and twelve times), I eagerly entered my first tune. "Nice graphics", I thought. However, I found some aspects of the program a little limiting, eg no notes shorter than a quaver were allowed, and I was restricted to between middle C and the G an octave and a half above. Tied notes were also not catered for, which could prove inconvenient.

The documentation (which included three sample tunes), seemed a little educational in style, which may account for the above shortcomings. The feature that I found most annoying though, was the fact that I could only delete the most recently entered note, which I needed to do more than just once. One other odd point was that the program seemed to avoid putting accidentals on lines, instead much preferring the space immediately above or below, which looked a little messy.

So, pressing the 'p' key to play, I sat back to hear someone else's melody echo in my ears, only to be rudely awakened. Again, good graphics, but the tune! Every time the program drew a barline there was a *very* audible pause. Quavers were out of time too; the program could not draw tham fast enough, and every time the program filled up a screen there was a pause of about two seconds while it cleared screen and redrew the three staves. Surely a little machine code could have been used here, or failing that (not everyone loves the Z80!) the music could have been printed first, and a pointer moved along in time. This fault, I am sorry to say, makes the program almost unusable, which is a pity considering the graphics and the need for such a program.

In conclusion, this package would not satisfy those who seriously want to make music.



Some of the complex screen displays you can expect from Bellflower Software's Music Maker package.

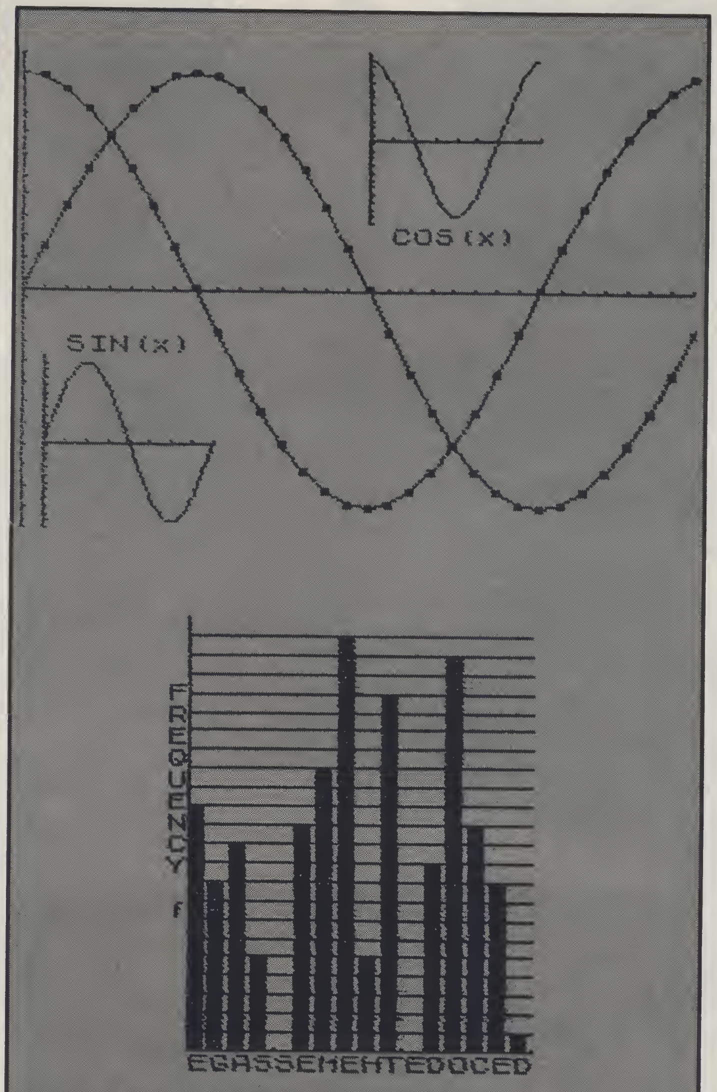
Grasp
— Camel Software

I approached this package with a little apprehension — not least because of the rather dubious name (!) since I have had limited experience with business/scientific programs.

It turns out to be a graph plotter capable of drawing line graphs, histograms and pie charts. It is also capable of drawing multiple graphs on the same, or different axes, and has the facility to expand and contract graphs, thus allowing inset graphs to be created. With histograms, four different types of shading are allowed, and with line graphs, you can adjust the length of dotted line between points, or you can choose to have a solid line or no line at all. Each set of data is callled a 'dataset' (surprise, surprise) and may contain up to 100 items each, and any dataset can be used for either axis.

The documentation is generally good, although I found it a little confusing in some places, especially when referring to control characters in the 'Interactive' mode, more of which later. Another part which I found rather unclear was the section on data entry, which seems to have been hastily skipped over (although most of the essential facts are there) and it didn't take long for me to grasp (hmmm . . .) the principle of operation. The manual is not suitable for the beginner, whether in computing or statistics, but anyone with a small knowledge of both is adequately catered for. A worked example would have been useful, though.

Obviously, the best way to evaluate a package of this kind is to try to create some graphs with it. So off I went, test data in hand, to try and create my own graphs. After reading the documentation thoroughly, I loaded the program. I found the menu page somewhat cluttered but soon got used to it. It did take a little while to redraw everytime I made a major change, or when returning after drawing a graph. So, on pressing the '1' key to enter data entry mode, the user is presented with nine options, including facilities to list, add, modify, and delete entries, as well as the rather powerful facility to create datasets using all the functions that the Spectrum can handle, eg sines, cosines, logs, etc. There is also, of course, a straight-line-fit facility for $y = mx + c$, although considering that quite a few scientific calculations will do this for under £25, one might have expected $y = mx$ (for functions that must pass through the origin) as well as fits such as $y = ax^b$ or $y = \log x$, since there are found in quite a few relationships in Physics and higher Maths. Then again, whole programs have been written to do only these functions, so perhaps it is asking too much to see them included in such a general piece of software as this.



Some example graphical displays obtainable from Camel Software's Grasp.

Pressing 'e' to exit from this sub-menu, we were returned to the main menu again. After setting up the many and varied options available to me, eg PAPER, INK and BORDER colours, position and size on screen, solid or dashed line, shape of plot points, number of 'ticks' on each axis; I pressed the '2' key for DRAW. The graph was drawn tolerably quickly, although when the fill option was used (ie fill in the line) on large graphs it could get rather long-winded, and there was no facility for breaking into this routine and getting back to the menu in one piece, which was especially irritating if you noticed that you had mis-chosen one option, since you had to wait for the graph to be drawn before you could go back and change it.

After spending about an hour familiarising myself with the package, I found it quite easy to create both graphs and histograms, but although I tried quite hard, for some reason I couldn't even get the shadow of a pie chart, let alone the real thing. Once your diagram has been created, you may go into interactive mode, which allows you to move graphs around (great fun and useful too!), change colours, erase bits, add text and generally play around with your masterpiece until you are satisfied with it.

In conclusion a very worthwhile program which I highly recommend to anybody who requires such facilities for home, school, or business.

Macro Construction and Animation
— Pinehurst Data Studios

This is one of the most original ideas for a piece of software I have seen yet. It is designed to launch the user into the world of 'Computer Movies'; well, that is what they claim, though I would describe these as 'Animated stories' than anything else.

It comes complete with a well written manual and demonstration 'Movie'. Though the graphics are not up to the latest arcade standard, the package is not designed to be the latest video game. It is a 'fun' idea that I found quite entertaining to use and, on the whole, the program does the task very well.

The sequences are built up using a selection of commands. The most common command is the 'Cast' command which allows you to call up any member of the 'cast' (includes men, women, a dog, a bird, a helicopter and many others) and make it move around or across the screen. It also has a number of other commands allowing the 'Director' to build up objects such as houses, or to display their standard sun, or a horizon. An interesting feature is that the 'movie maker' can store tunes and play them back at key points in the story. There is a command which allows text to be printed on the screen, which is useful for representing speech by the characters. On the whole, the program is very versatile and I found it an entertaining change from the usual 'shoot-em up' game.

The cassette is produced by 'Pinehurst data studios' (sounds suspiciously like Pinewood film studios doesn't it?) and sells for £7. Good value, with lasting appeal.

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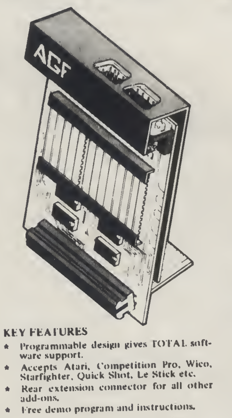
MICRODRIVE COMPATIBILITY

Computer
Trade
Association
Member

PROGRAMMABLE JOYSTICK INTERFACE for Spectrum or ZX81

ONLY 32-95 +£1·00pp

NOW AVAILABLE from SELECTED RETAILERS



PROGRAMMABLE INTERFACE

The AGF Programmable Joystick Interface is a unique design offering the use of any Atari-compatible joystick with absolutely all software, whether it is cassette or ROM cartridge, with the Sinclair Spectrum or ZX81.

The hardware programmable interface requires no additional software and accurately replicates the keys of the computer in a manner which is responsive to absolutely *ALL* key reading methods, both BASIC and Machine Code.

The interface does not interfere with key operation and can therefore be used simultaneously with the keyboard.

There is no need to remove the interface once fitted as the rear extension connector will accommodate further expansion, i.e printers or RAM packs etc. This important feature avoids excessive wear to the expansion port.

The key replication principle pioneered by AGF means that your own programs can use eight directional joystick movement by utilising simple key reading BASIC.

Two joystick sockets are provided which share the same keys, for use with the majority of two player games. Several interfaces may be used on the same computer for multiple joystick applications.

The interface is programmed by a two digit code, which is looked up on a programming chart supplied, for each direction and firing button. The two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked on a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface retains the last configuration made and can be immediately used when next switched on.

KEY FEATURES

- ★ Programmable design gives TOTAL software support.
- ★ Accepts Atari, Competition Pro, Wico, Starfighter, Quick Shot, Le Stick etc.
- ★ Rear extension connector for all other add-ons.
- ★ Free demo program and instructions.

PACKAGE CONTENTS SUPPLIED

- Programmable Interface Module as illustrated, complete with clip-on programming leads.
- Self adhesive programming chart detailing how to define which key is simulated by UP, DOWN, LEFT, RIGHT, and FIRE. This can be fixed on to the case of your computer or if preferred the protective backing can be left on. The chart is made of a very durable reverse printed plastic and is extremely easy to read.
- One pack of ten Quick Reference Programming Cards for at-a-glance setting to your games requirements. The card allows you to mark the configuration in an easy to read fashion with space to record the software title and company name.
- Video Graffiti demonstration program which is written totally in BASIC to illustrate how all eight directions and fire can be read. This is also a useful high resolution drawing program.
- 12 months guarantee and full written instructions.

JOYSTICKS

CONTROLLERS
FOR USE WITH OUR INTERFACE
Module or VIC 20, Commodore 64, Atari VCS, Atari 400, Atari 800

If you require extra Joysticks for our original interface module mark order 'OLD' Joysticks

ONLY £7.54 inc VAT + P&P

PLEASE ALLOW 28 DAYS FOR DELIVERY

ALL ORDERS CONFIRMED

FROM: MR/MRS/MISS

ADDRESS

SEND C.W.O. (NO STAMP NEEDED) TO: A.G.F. HARDWARE, DEPT. **ZXC**

FREEPOST, BOGNOR REGIS, WEST SUSSEX, PO22 9BR

QTY	ITEM	ITEM PRICE	TOTAL
	PROGRAMMABLE INTERFACE	33.95	
	JOYSTICK(S)	7.54	
	PACK(S) QUICK REFERENCE CARDS	1.00	
ONE	VIDEO GRAFFITI	FREE	
		FINAL TOTAL	

ZX81 ☐ ZX SPECTRUM ☐ Please tick

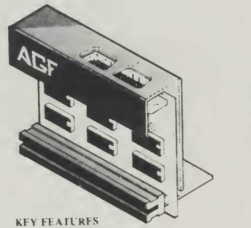
DEALER ENQUIRIES WELCOME *EXPORT PRICES ON APPLICATION*

JOYSTICK INTERFACE II for Spectrum or ZX81

NEW PRICE

ONLY ~~19-95~~ +£1·00pp

15.9



JOYSTICK INTERFACE

The Interface Module II has been specially designed to plug on to the rear connector of your ZX Spectrum or ZX81 and allow you to connect any standard Atari type digital Joysticks. All of the computer's connections are duplicated on an extension connector so that you can still use any other devices intended for use with your computer.

The Interface Module II resides in the same memory space as the keyboard, which remains fully functional at all times, therefore it will not interfere with anything else connected.

When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key ϕ. This unique feature guarantees the best software support.

Take a look at the selection of compatible games we have listed. More are being added all the time as a result of our contact with the various software companies.

A second Joystick may be connected in the 'Player 2' position which simulates in a parallel fashion keys T-Y-U-I-P. This will allow you to play a whole new generation of two player games.

KEY FEATURES

- ★ Proven cursor key simulation for maximum software support
- ★ Accepts Atari, Competition Pro, Wico, Starfighter, Le Stick, etc Joysticks
- ★ Second Joystick facility
- ★ Rear extension connector for all other add-ons

AGF COMPATIBLE SOFTWARE – AVAILABLE NATIONWIDE

The following titles are available from

Galactic Jailbreak/ Snake	Apocolypse Software
3D Tanx	DK 'Tronics
Splat !	Incentive Software Ltd
Pheenix	Megadodo Software
Escape	New Generation Software
3D Tunnel	" "
Knot in 3D	" "
Cyber Rats	Silversoft

COMPATIBILITY CASSETTES £4.9

These cassettes have short program load before the chosen game which convert it to use the cursor keys and fore become compatible with the Int Module II.

Cassette 1 converts	Cassette 2 conve
Arcadia	Centipede
Schizoids	Planetoids
Hungry Horace	Jet-Pac
Horace Goes Skiing	÷ Pssst
Spectres	÷ 3D Combat Zo
Penetrator	÷ Invaders

÷ *Will require 48K Mem*

FROM: MR/MRS/MISS

ADDRESS

SEND C.W.O. (NO STAMP NEEDED) TO: A.G.F. HARDWARE, DEPT. **ZXC**

FREEPOST, BOGNOR REGIS, WEST SUSSEX, PO22 9BR

QTY	ITEM	ITEM PRICE	TOTAL
	INTERFACE MODULE II	16.95	
	JOYSTICK(S)	7.54	
	SOFTWARE		
	SOFTWARE		
		FINAL TOTAL	

ZX81 ☐ ZX SPECTRUM ☐ Please tick

DEALER ENQUIRIES WELCOME *EXPORT PRICES ON APPLICATION*

WHERE TO BUY AGF PRODUCTS OVER THE COUNTER

Ashby Computer Centre
186 Ashby High Street, Scunthorpe,
S. Humberside DN16 2JR
Brainwave Microcomputers
24 Crown Street, Ipswich, Suffolk IP1 3LD
Buffer Micro Ltd
310 Streatham High Road, London SW16
Chelsea Micros Ltd
14 Jerdan Place, London SW6 1BH
Computers of Wigmore Street
87 Wigmore Street, London W1H 9FA
Everybodys Hobbies
1 Great Colman Street, Ipswich,
Suffolk IP4 2AA

4Mat Computing
67 Friargate, Preston, Lancashire PR1 2AT
Gamer
24 Gloucester Road, Brighton BN1 4AQ
GB Microland
7 Queens Parade, London Road,
Waterlooville, Hants
Melgray Hi-Tech Ltd
49 Broad Street, Hereford HR4 9AR
Micro Fare
296 Gloucester Road, Horfield, Bristol
Raven Video
74 Green Lane, Tettenhall, Wolverhampton
Screen Scene
144 St George's Road, Cheltenham
Gloucestershire GL50 3EL

Screens
6 Main Avenue, Moor Park, Northwood
Middlesex.
Syntax Computers
76 Cornwall Street, Plymouth PL1 1NS
Teleco Video
53 Maple Road, Penge, London SE20
Telford Electronics & Computing
26a Bradford Street, Shipnal,
Shropshire TF11 8AU
The Computer Shop
Unit 25, Handyside Arcade, Percy Street,
Newcastle-upon-Tyne NE1 4PZ
The Computer Centre (Humberside) Ltd
26 Anlaby Road, Hull HU1 2PA

Window shopping

If you're thinking of adding onto your ZX81 or ZX Spectrum, why look any further than our comprehensive hardware features?

The Sinclair range of computers must be the most well-supported range of microcomputers in the world. And not least by Sinclair Research themselves — especially as they now provide not only the ZX Printer and RAM pack, but also the Interface 1, Interface 2 and ZX Microdrives.

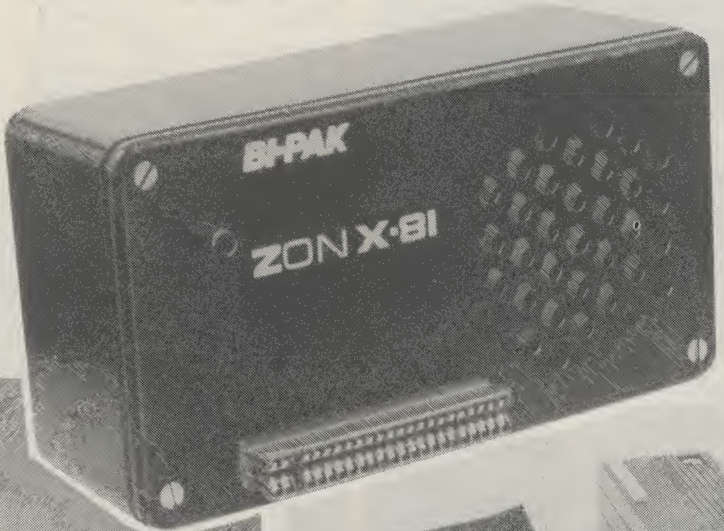
However, alongside these pieces of equipment, there is a wealth of hardware produced by independent companies which when added to your micro can make for a very substantial package.

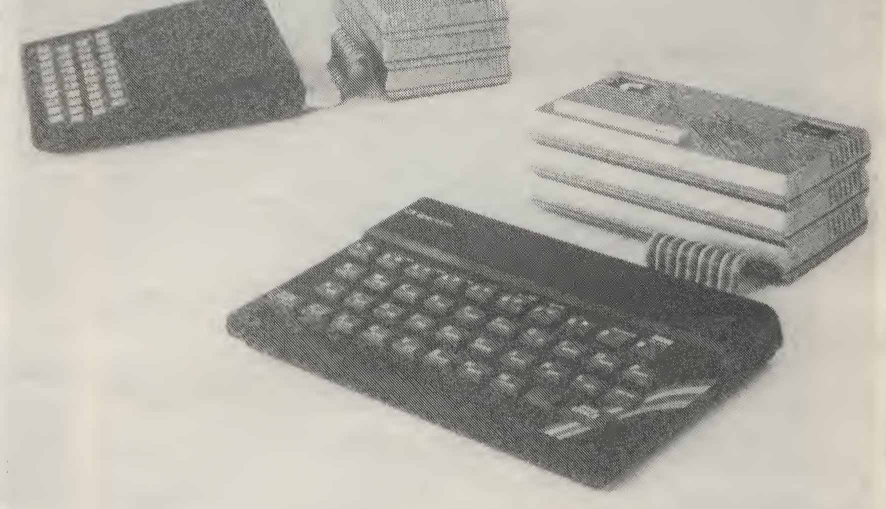
Obviously, in a feature this size, we can only really hope to scratch the surface of these devices. But, hopefully, we can provide enough information to help you decide the areas you would like to expand your system to include, and perhaps some of the companies you would like to include on your shortlist.

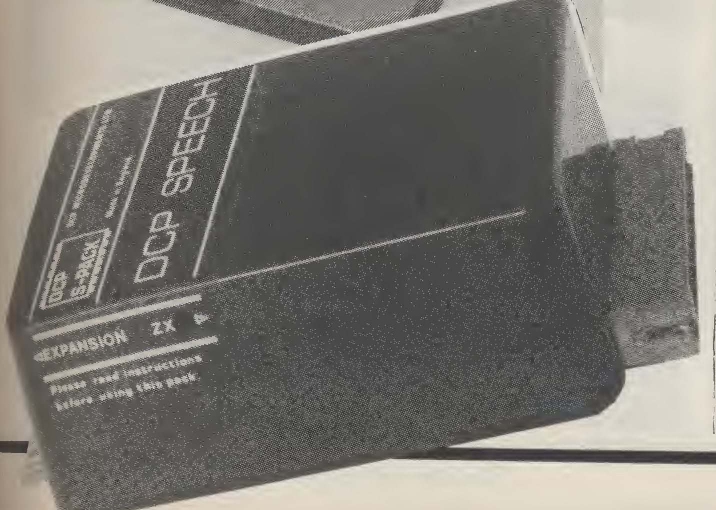
This feature is not really so much of a review, but more of an expanded checklist. So, while some products may only get a small mention, this is no real reflection of the quality of that product. Rather, you should use this article as a springboard for the future expansion of your Sinclair system.

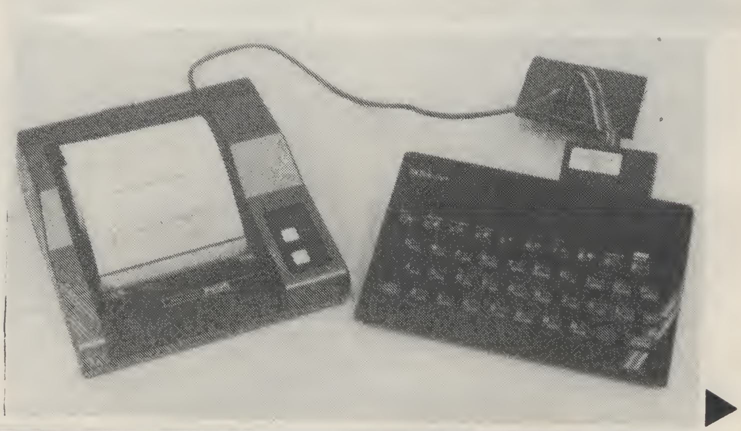
Hopefully, in future issues of *ZX Computing*, we will be able to take a closer look at some of the more interesting products our investigation of the hardware market has thrown up — so keep watching these pages!

In the meantime, have a look through the plethora of devices on offer and dream about your perfect micro system. And then, follow those dreams up — write or 'phone the companies mentioned and ask for further information. You'll be surprised how helpful they can be!









Firmware, etc

In . . . . Brief

- The Orme Electronics EPROM Card for the ZX Spectrum can be used to provide more facilities for BASIC programs. With the EPROM fitted in the Spectrum's ROM space you have 10 extra routines for re-numbering, editing, character manoeuvering, and variable dumping. Designated EPROM 1, the device is priced at £9.95. For further details contact Orme Electronics, 2 Barripper Road, Camborne, Cornwall TR14 7QN or 'phone 0209 715034.

- The MZ-8 is designed to interface with the ZX81 and has two functions controlled by on-board DIL switches. Firstly, it provides storage of up to 10 programs in BASIC and/or machine code up to a total of 6K, and secondly the device provides 6K of extra memory. Software is provided in a 2K EPROM and gives a monitoring facility whereby system status is displayed on-screen. Priced at £44.90, you can find out more about the MZ-8 from Micro-Z Ltd, PO Box 83, Exeter, Devon EX4 7AF.

- Specspansion is a combined four slot motherboard and 24 line bi-directional programmable port board for the ZX Spectrum. The device plugs directly into the rear connector of the Spectrum and provides facilities for other peripherals to be added. Priced at around £30 for the complete package, you are also provided with a software programming aid on cassette. There is room for four additional cards, which the makers are expecting to produce in the future. For more information contact F B Tronics, Unit 2, Park Brook Industrial Estate, Park Street, Lye, Stourbridge, West Midlands DY9 8SS.

- You can upgrade your Spectrum, either issue 1 or issue 2, from 16K to 48K using a RAM kit from Delta Research Ltd. Free with each RAM kit comes Delta Chipchek, a memory diagnostic cassette providing computer standard testing of the existing 16K RAM and the 32K extension. The issue 1 RAM kits are priced at £37 and the issue 2 versions are priced at £31. For more information contact Delta Research Ltd, 15 Church Street, Basingstoke, Hants RG21 1QG or 'phone 0256 69345.

Add-ons – Haven Hardware

Haven Hardware have a great selection of add-on boards for your ZX81 or ZX Spectrum.

For the ZX81, there is a programmable character generator, priced at £15.95; a repeating key module, priced at £3.95; an inverse vieo module, priced at £3.50; a keyboard beeper, priced at £6.95; a keyboard entry module, priced at £2.95; an input/output port, priced at £11.95; a full size keyboard, priced at £18.95; and many more. You can also obtain these kits as fully built units although you will have to add about a quarter of the price again.

Haven Hardware also provide devices for the Spectrum including an I/O port which has eight inputs and eight outputs accessible via edge connectors on the edge of the pcb. This is priced at £12.95 for the kit or built for £16.95.

For further information get in touch with Haven Hardware at 4 Asby Road, Asby, Workington, Cumbria CA14 4RR or 'phone 094-686 627.

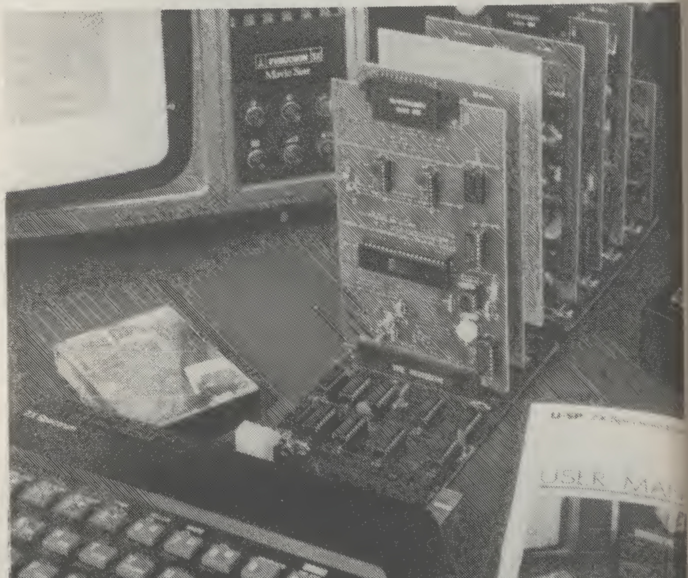
Expansion Bus – U-Microcomputers ▼

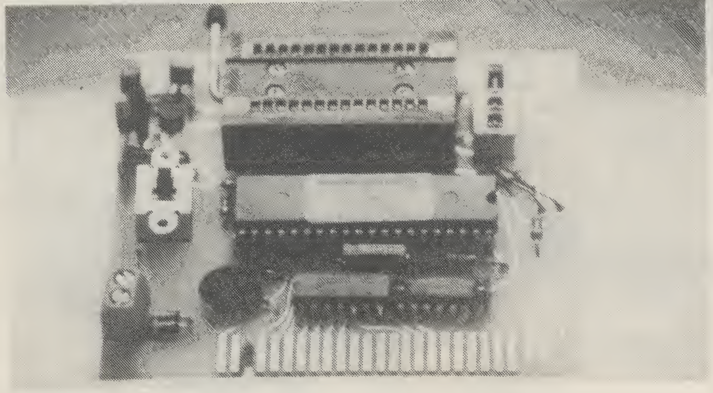
U-Microcomputers have introduced two new interface cards for their expansion bus system.

The USP-232D, priced at £34.50, is a powerful dual channel serial interface utilising the sophisticated Z80-DART chip. Software included comprises an LLIST and LPRINT patch and dumb terminal emulator. You also get a 56 page manual.

The USP-I/O is a general purpose parallel interface utilising the Z80-PIO chip. This card provides 16 input or output lines and four control lines. Applications include connection to plotters, music synthesisers, D/A and A/D converters and, of course, printers. The USP-I/O is priced at £29.90.

For more information on these and the further cards available, get in touch with U-Microcomputers Ltd, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR or 'phone 0925 54117.





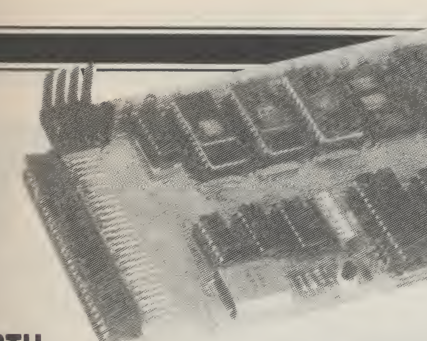
Add-on accessories – EPROM Services ▲

EPROM Services have a wealth of add-on devices for both the ZX81 and the Spectrum.

Priced at £19, there is the EPROM board, which can accommodate up to 8K or 2K EPROM or 2K RAM ICs. This memory is located at 56-64K, but with simple modifications it can be made to relocate the board to the 48K area. They also make available an Auto Start unit, priced at £9.95, which gives an automatic jump to location FDOO Hex on switch-on.

For the ZX81, there are a plethora of EPROMs available, priced between £9.95 and £19. These can be used for rapid LOAD/SAVE, tool kit, disassembler, graphics control, character set, monitor and other uses.

However, EPROM Services are responsible for much more hardware than can be briefly mentioned here, so it might be worth you giving them a buzz on 0532 667183 or writing to them at 3 Wedgewood Drive, Leeds LS8 1EF, if you are looking for a particular application.

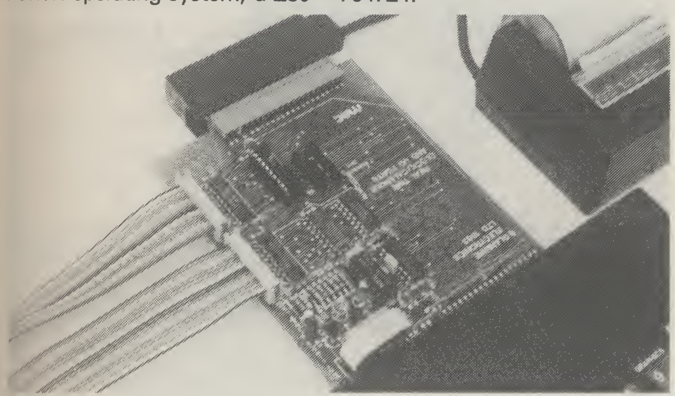


FORTH – David Husband

David Husband has come up with an interesting concept for the Spectrum — a ROM cartridge containing 12K of Fig-FORTH, a full RS 232 interface via an 8251, and 24 bits of parallel I/O via an 8255.

The BASIC ROM is switched out and replaced by the FORTH ROM, which contains all the standard Fig-FORTH words. The device also offers a multi-tasking FORTH operating system, a Z80 assembler for machine code FORTH definitions, a terminal routine to support a modem, a crystal-controlled baud rate generator for the RS 232, a machine code monitor, RS 232 and Centronics printer routines, and 4K or ROM for future software enhancements.

The retail price of the package is £59 + VAT. For more details, contact David Husband, 2 Gorleston Road, Branksome, Poole BH12 1NW. Telephone enquiries can be made on 0202 764724.



Time Controller – Glanmire Electronics ▲

Consisting of a battery backed real time clock, the Time Controller has eight programmable inputs and eight programmable outputs.

With its own built-in program, in PROM, only a single instruction is necessary to read or write the month, day, date, hours, minutes or seconds. There is also an extension connector should you wish to add other peripherals onto the board.

Applications for this device include electronic diary with alarm, home control, burglar alarm, sound effects and process control.

The prices of this device are £34.50 for the ZX81 version and £38.50 for the Spectrum model.

For more information on the Time Controller, contact Glanmire Electronics, Westley House, Trinity Avenue, Bush Hill Park, Enfield EN1 1PH. Telephone enquiries can be made on 01-366 3245.

MUKBUS – Microtext ▶

The Microtext MUKBUS Card Frame System plugs into the Spectrum's rear edge connector and fully buffers the signal lines onto a six slot motherboard. With this unit, the Spectrum enthusiast should be able to make use of the full range of MUKBUS interfaces, as well as use their prototyping card which can be used to build any interface or computer project you can think of!

Also compatible with the card frame, Microtext offer a power supply capable of powering the Card Frame together with interfaces, Spectrum and two micro floppy disc drives.

The Card Frame is priced at £59.95 and the power supply is available at £39.95. For more information contact Microtext UK Ltd at Highland House, 20-24 John St, Luton, Beds or 'phone them on 0582 418894. You might also like to ask them about their new range of printed circuit cards, including floppy disc, RS 232/Centronics, 80 column video, 64K page mapped memory and bar code reader interfaces.

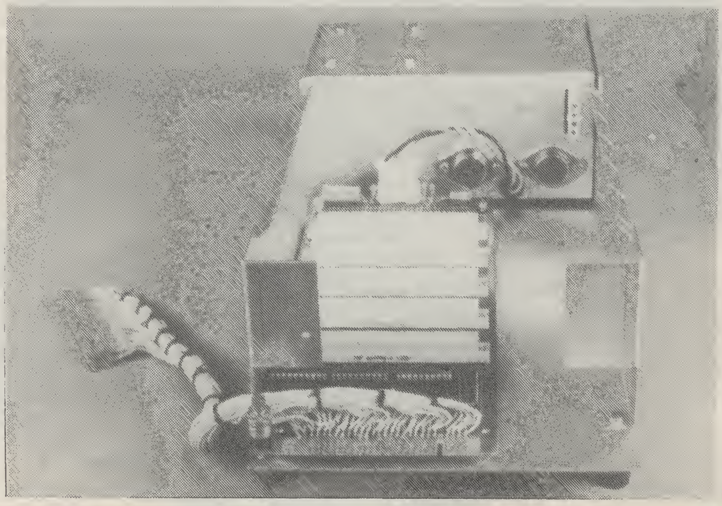
In . . . . Brief

● Stephen Adams has come up with a number of interesting devices for the ZX81 and ZX Spectrum. The Straight Adaptor converts the Spectrum to the same expansion port as the ZX81, but does not do any address conversion thus providing you with a full 64K of addresses when the printer is being used. He has also developed the Adam and Eve Adaptors. The Eve Adaptor allows owners of the 48K Spectrum to utilise the wide range of ZX81 peripherals (as long as those devices operate in the 0-16K section of the ZX81's memory map. The Adam Adaptor simply allows you to add a Sinclair compatible RAM pack to your 16K Spectrum, thus doubling your storage at a stroke. The Adam II Adaptor, an update of the Adam Adaptor, allows the use of two sets of peripherals at the same time on the 16K Spectrum. All the adaptors are available at £9. For the ZX81, Stephen has developed a programmable tape controller, the RZ1, for the Spectrum and ZX81. As well as not having to change the leads as you are SAVEing and LOADing, the cassette motor is set under program control. The price of this device is £20. For further details contact Stephen Adams at 1 Leswin Road, London N16 7NL or 'phone him on 01-254 1869.

● The interface board from Interceptor Micros is designed to connect a standard Atari-type joystick to the ZX Spectrum. There are two positions for joysticks and there is room for further peripheral expansion. Instructions are provided with the package to help the user check that the board is working up to the correct standards, and a software demonstration tape is also included. Priced at £15.95, you can obtain more information from Interceptor Micros, Lindon House, The Green, Tadley, Hants.

● JRS Software have on offer a number of ICs which transform your Spectrum from 16K to 48K. The first issue Spectrum can be upgraded using a RAM board which is fitted inside the computer. Requiring no soldering, the RAM board is priced at £42.50. For the issue two Spectrums, there are 12 ICs provided, marked A to E which are to be fitted inside the Spectrum, replacing ICs already in position. Installation is carried out simply by following a diagram supplied. The price of the ICs is also £42.50. JRS Software can be contacted on 0903 65691 or by writing to 19 Wayside Avenue, Worthing, Sussex BN13 3JU.

● For issue two Spectrums only, there is a Spectrum upgrade to 48K available for only £24.50. For further details, get in touch with Fountain Computers Ltd, Darvill Road, Ropley, Alresford, Hants SO24 0BW. You could also ask them for their instructional sheet concerning the way to get the best out of the display of the Spectrum. Priced at £1, this A4 sheet shows you how you can get a marvellous display simply by adjusting a few internal controls of the Spectrum.



▶

In . . . . Brief

● The Fuller 16K RAM pack is designed to fit onto the back of the ZX81 and is priced at £24.95. You could also investigate the possibility of utilising the FD Motherboard — then you could have a 16K RAM card or a 64K RAM card added to your system. For further details contact Fuller Micro Systems, The ZX Computer Centre, Dale Street, Liverpool 2 or 'phone 051-236 6109.

● The 16K RAM pack from Data-assette is priced at £28.95. You can also purchase a plug-in module for your ZX81, which when used with the RAM pack will expand your memory up to a full 32K. The price of this unit is £29.95. Further information is obtainable from Data-assette, 44 Shroton Street, London NW1 or you can 'phone 01-258 0409.

● A floppy disc controller for the ZX81 offers single or double density compatibility with all Shugart 5¼ inch drives, the new Japanese 3 inch drives and the Hungarian MCD1 3 inch drives. Set to enter the market at around £40, you can find out more from Analogue Information Systems Ltd, 43 Gilmour Road, Edinburgh 16 or by telephoning 031-667 6862.

● Technology Research Ltd have announced the availability of a floppy disc interface card for use with the Spectrum which will work with any Shugart standard disc drive or with the new Micro Disc 1 drives. Further details are available from Technology Research Ltd, 57 Brockley Rise, London SE23. Telephone enquiries can be made on 01-699 5332.

● Audio Computers have introduced a RAM pack, priced at £19.95, for the ZX81 to make it up to a full 16K. The unit incorporates feet to make it up to the same height as the micro and has a plastic grip which hangs over the top of the ZX81 holding the RAM pack in place. For more details on this device, get in touch with Audio Computers at 87 Bournemouth Park Road, Southend on Sea, Essex or telephone them on 0702 613081.

Memory

Arab RAM – Autoram ▾

Here is a device which when fitted between the ZX81 and a RAM pack will provide the user with a complete set of characters, keywords and functions in an Arabic version of BASIC called Saudia.

The new language is set with well-designed character shapes providing good legibility on the screen. Arabic equivalents to all the keywords, functions, etc, have all been carefully chosen and special keyboard overlays are available with the device with the various words converted for the new language.

All the ZX81 performance features have been retained, even though the writing occurs from right to left and decimal numbers are evaluated from left to right. An easy-to-follow instruction booklet is provided as part of the package.

The manufacturers of the Arab RAM can be contacted at PO Box 147, Jeddah, Saudi Arabia.

RAM Packs – Stonechip Electronics

From Stonechip Electronics comes the ZX Panda, a 16K RAM extension for the ZX81.

Housed in a sturdy box, the pack connects to the rear of the '81 via a tin-plated edge connector. There is also an LED built into the unit to indicate that power is reaching the RAM pack.

There is no extension connector at the back of the device, but it is possible to add a further 16K inside the box with a RAM board priced at £14.50.

The ZX Panda is available from Stonechip electronics, priced at £19.95, at Brook Trading Estate, Deadbrook Lane, Aldershot, Hants GU12 4XB. Telephone enquiries can be made on 0252 318260.

You might like to also ask them about their other add-ons for the Spectrum including a light pen, an echo emplifier, a programmable joystick interface and a keyboard.

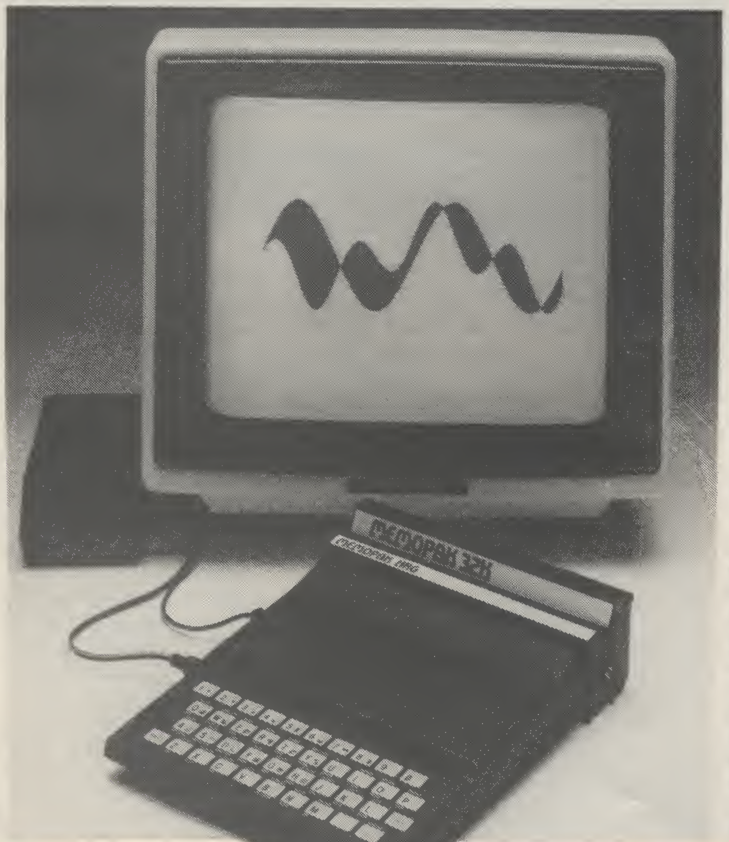
RAM Packs – Memotech ◂

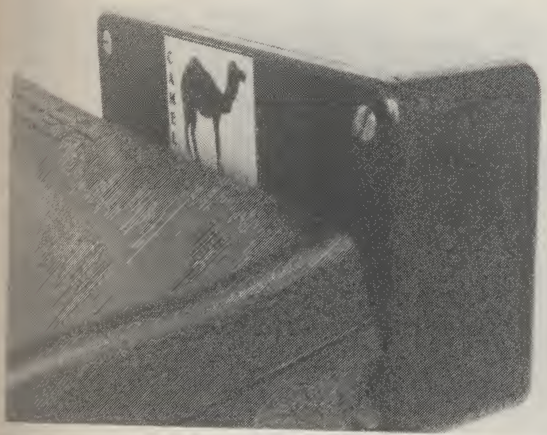
Memotech provide a wealth of hardware add-ons for the ZX81, including a number of memory packs.

Called Memopaks, the units fit snugly onto the back of the '81 and can be stacked together to further enhance your micro system. To simply extend the memory capacity of the ZX81, you can add the 16K, 32K or 64K Memopaks, which are priced at £29.90, £49.95 and £79 respectively.

To extend your micro system still further, you could always add one of the other three Memopaks which provide a High Resolution Graphics package, a Centronics Printer Interface, and an RS 232 Printer Interface. These are all priced at £39.90.

You could also ask Memotech about their ZX81 keyboard if you're going to 'phone them on 0993 2977. Written enquiries can be directed to Station Lane, Witney, Oxon OX8 6BX.





RAM Packs – Cambridge Microelectronics ▲

Amongst the range of products Cambridge Microelectronics have on offer, there is the 64K RAM extension for the ZX81. Complete with an LED indicator for power, the unit comes with a link option to disable RAM in the 0-16K area of the ZX81's memory and is designed to accept an EPROM as an alternative. The price of this unit is £69.95 + VAT and has been designated the Dream-81.

Another product might of interest and that is the ROM-81, which is a memory expansion unit for the ZX81. This enables the user to read useful routines and commonly-used information, stored in UV erasable PROM. The unit is supplied without EPROMs as these are normally programmed and provided by the user. The price of this device is £17.20.

For more information on these and other products in their range, get in touch with Cambridge Microelectronics Ltd, 1 Milton Road, Cambridge CB4 1UY or 'phone 0223 314814.

Organic Micro – BASICare Microsystems ▼

The Organic Micro is a series of stackable add-on devices for your ZX81 or ZX Spectrum.

Each module plugs firmly into each other giving you a modular range of options. The foundation of this system is the Persona unit which is the direct interface to the computer. Thereafter, all the add-ons simply plug into and stacked on top of this unit. These options may include memory expansions, Centronics interface, Input/Output, access and control of the outside world, EPROM/ROM utilities non-volatile storage of program or enhanced graphics facilities. There is even the Sonus, a new package which comprises a versatile sound synthesiser.

The range of extensions to your computer's use will increase as BASICare bring out more modules. Projects in the planning stage at the moment include a floppy disc interface, joystick controller and an EPROM programmer.

The original Persona unit you will need is priced at £39.50, and the other peripheral devices are priced between £22.20 and £41.75. For further details of these packages contact BASICare Microsystem Ltd, 12 Rickett Street, London SW6 1RU or 'phone 01-385 2135.

In . . . . Brief

● Extending the memory capacity of your Spectrum is no problem for East London Robotics. They have the SP48, which expands your 16K model to 48K, and the SP80 which takes your Spectrum to an 80K machine. The 32K expansion costs £35 for issue one machines and £23 for issue two models. Likewise for the 64K expansion, it will cost you £50 for issue one expansion and £46 for issue two models. For more information speak to East London Robotics on 01-471 3308 or write to them at Gate 11, Royal Albert Dock, London E16.

● You can expand your computer's memory, be it Spectrum or ZX81, with equipment from dK'tronics. They make available a 16K and 48K RAM pack for the ZX81 which are priced at £22.95 and £52.95 respectively. Upgrades for your 16K Spectrum to make it up to a 48K model will cost £35 for issue one and £30 for issue two machines. Further details are available from dK'tronics, Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ. Telephone enquiries can be made on 0799 26350.

● For the ZX81, Computer Add-ons have a 16K RAM pack for £15.99 and a 64K model for £44.25. They also provide RAM add-ons for the Spectrum including memory upgrades taking the 16K model up to 48K. These are priced at £34.50 for the issue one Spectrum and £20.50 for the issue two machine. A 64K memory upgrade is available for the issue two Spectrum, bringing it up to 80K in all, for £44.25. For more details call 01-609 7919 or write to Computer Add-ons, 7-9 Thane Works, Thane Villas, London N7.

● Add-on firm, Indescorp, have produced some new hardware pieces for the Spectrum and ZX81, including some memory devices for the ZX81. There is the 16K, 32K and 64K units and these are priced at £16.95, £21.70 and £32.69 respectively. They are also providing an external expansion unit for the Spectrum making it up to 48K which is priced at £28.50. For more information on Indescorp and the rest of their Sinclair range of hardware, including keyboards, joysticks, sound generators, etc, write to them at P.° Castellana, 179, 1.° Madrid 16, Spain.

● Cheetah Marketing Ltd have introduced a 32K RAM pack for the 16K Spectrum allowing it to be upgraded to a fully fledged 48K machine. Its injection moulded case has been specifically designed to fit the contours of the Spectrum to stop worries of the 'RAM pack wobble' syndrome. The device is fully compatible with all Spectrum accessories. Priced at £39.95, you can find out more about the units if you write to Cheetah at 359 The Strand, London WC2R 0HS or 'phone 01-240 7939.

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In . . . . Brief

● Morex Peripherals have put together two interfaces, both priced at £39.95, in one box, with versions for the Spectrum and the ZX81. Each package includes a Centronics parallel and a bi-directional RS 232 interface. With these devices you can print the full length line allowed by the printer you attach your micro to, use the LLIST and LPRINT BASIC functions, and use a selection of baud rates. The Spectrum version uses a built-in operating system allowing you to use word processing packages. For the ZX81, software will soon be available to allow word processing and graphics to be used. For more information, get in touch with Morex Peripherals Ltd, 2 Balliol Road, Caversham, Reading, Berks or 'phone 0734 478854.

● Hilderbay have produced an interface in the Centronics style for the Spectrum as well as the software to run it. Complete with one metre of cable, the package is priced at £45. Software for the Hilderbay interface is written in BASIC and machine code, and supports the use of LLIST and LPRINT, as well as including a software routine so that you can copy the screen. The software provided also includes a mini-word processor from Tasword. More details of this interface combination can be obtained from Hilderbay Ltd, 8-10 Parkway, London NW1 7AA. Telephone enquiries can be made on 01-485 1059.

● A parallel Centronics interface, ZX LPRINT, is available from Euroelectronics for £30. Packaged in a solid housing, the unit plugs into the rear connector of the Spectrum. The device can cope with the Spectrum keywords, LLIST and LPRINT, but needs additional software to use the COPY command; this can be supplied on a cassette for those that require it. Further information is obtainable from Euroelectronics, Zlin House, Oakfield Street, Cheltenham, Glos GL50 2UJ.

● Cobra Technology have two interfaces for the ZX81 providing connection to either a Centronics printer or an RS 232 printer. The devices connect onto the back connector of the ZX81 and provide a baud rate variable under software control. Both units are priced at £26 + VAT, and you can find out more about them from Cobra Technology Ltd, 378 Caledonian Road, Islington, London N1 1DY.

Interfaces

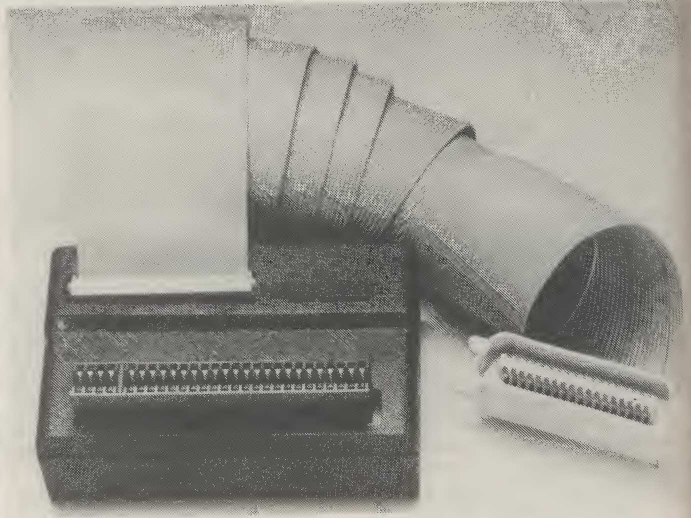
Centronics I/F – Kempston▼

This interface allows the Spectrum to be connected to any Centronics type printer.

Housed in a purpose built case, with one metre of cable, the interface fits onto the rear connector of the Spectrum. Software provided with the package allows the recognition of the BASIC keywords LLIST and LPRINT allowing programs and text to be listed and text to be printed up to the full length of the printer attached. There is also provision for the screen to be copied onto the printer. The software provided is written in machine code and caters for both the 16K and 48K version.

The interface is fully compatible with Tasword II, the business word processing package, and with a few minor alterations you can also use Psion's Vu-Calc.

The Centronics interface, complete with printer cable and supporting software, is priced at £45. For more information contact Kempston Micro Electronics, 180A Bedford Road, Kempston, Bedford MK42 8BL. You can 'phone them on 0234 852997.



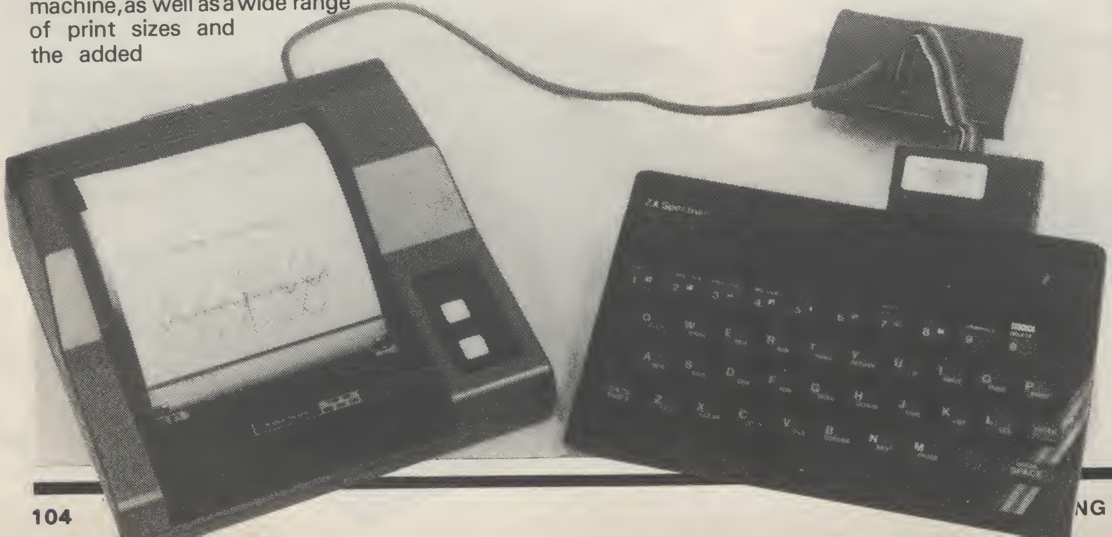
Spectrum/Tandy I/F – Softest ▼

The Softest interface allows the ZX Spectrum and ZX81 to be connected to the Tandy semi-intelligent printer, the CGP-115.

The interface allows printing and plotting on the Tandy machine, as well as a wide range of print sizes and the added facility of overprinting in different colours. The printer itself has four pen colours: red, green, blue and black; and the printing speed is 52mm/sec on the horizontal and 73mm/sec on the vertical.

The interface hardware comes complete with software, written in machine code to control the movement of the pens. With this package you can print out text, plans, drawings, program listings, pcb layouts, charts and oversize lettering.

Priced at £35, you can find out more information from Softest, 10 Richmond Lane, Romsey, Hants SO5 8LA. There is also available additional software allowing you to copy the Spectrum screen onto the Tandy printer, priced at £5.



Centronics I/F – Advanced Digital Systems

Advanced Digital Systems have introduced a Centronics interface for both the ZX81 and the ZX Spectrum.

Complete with one yard of cable and a Centronics plug, the package comes complete with software which recognizes LLIST and LPRINT enabling direct printouts from BASIC. This unit is guaranteed for 12 months.

As well as being compatible for both the ZX81 and Spectrum, with additional software and an inexpensive adaptor card, you can also use the interface with the Jupiter Ace.

The complete package is available from Advanced Digital Systems for £34.50, and for more information you could write to them at 9 Bonchurch Road, Portsmouth, Hants PO4 8RY. Telephone enquiries can be made on 0705 823825.

Keyboards

In .... Brief

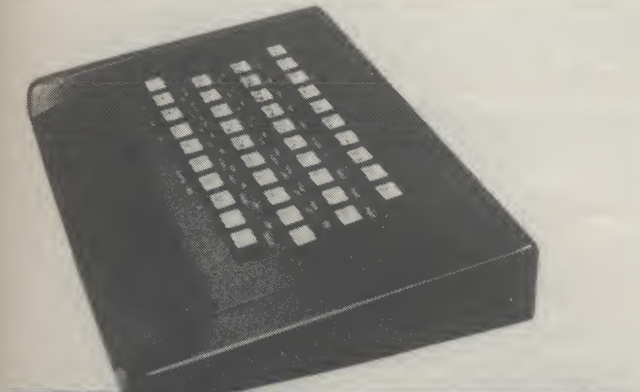
- For physically disabled people, there is a special series of keyboards. There is the Desk-top Scanning device, the Briefcase Scanning model and the Expanded Keyboard model. Each has been designed to help people with certain afflictions.The price of the units is very much dependent on the input devices used with the keyboards, so it would be best if you made further enquiries to Possom Controls Ltd, Middlegreen Road, Langley, Berks SL3 6DF or 'phone 0753 79235.

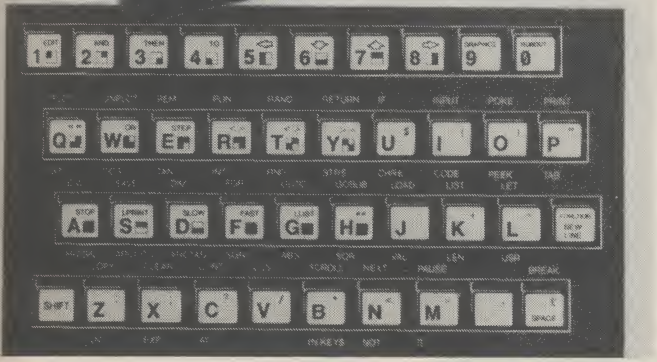
- A new concept in keyboard overlays has been introduced by Tactile aimed at early education programmers. The Tactile keyframe fits over the Spectrum, and a series of keyboard overlays can be attached. The overlays come in all sorts of shapes and colours, and the company produce campatible software which utilise the overlays. For further information contact Tactile, Wraith, 32 Elmfield, Kingswood, Bristol BS15 2SS or 'phone 0272 678431.

- Consisting of a black ABS resin case, the Push Button keyboard locates over the ZX81 keyboard providing a much improved keyboard. Once attached, you have a keyboard overlay with raised keys which provide a positive feel to them when pressed. Priced at £9.95, you can find out more about this inexpensive keyboard alternative from Filestixty Ltd, 25 Chippenham Mews, London W9 2AN or by telephoning 01-289 3059.

- Microtext have produced a keyboard for the Spectrum which is priced at £53.45. The keycaps are clearly marked, some in five colours, thus denoting their function. The keyboard also incorporates a cursor control pad with a 'fire' button and four sensibly placed direction buttons. For more information contact Microtext UK Ltd, Highland House, 18-24 John Street, Luton, Beds LU1 2JE or 'phone 0582 418894.

- The FD42 keyboard has been designed not only to contain the ZX81 or Spectrum, but also Fuller's own range of motherboard, power supply, RAM cards, as well as room for two other boards. The case itself houses a 42 keyswitch board; the extra keys can be assigned to a special function. The price of the unit is £29.95 and you can find out more from Fuller Micro Systems, The ZX Computer Centre, Dale Street, Liverpool 2. Telephone enquiries can be made on 051-236 6109.





Keyboard Case — dK'tronics

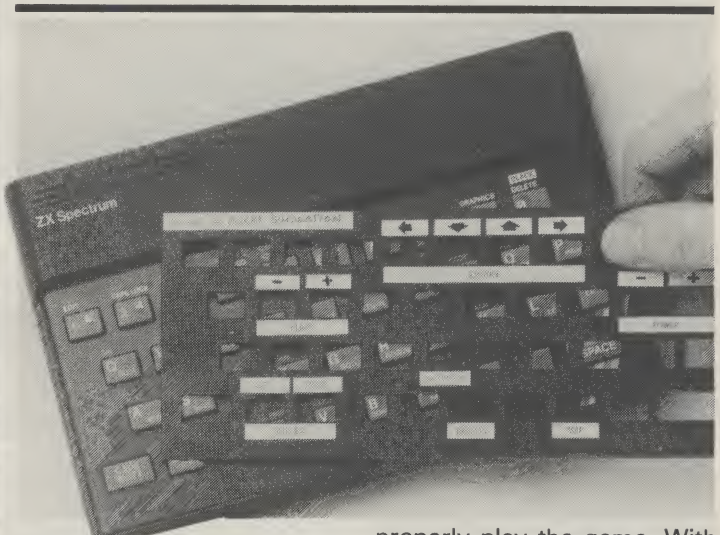
A keyboard is now available from dK'tronics which can be used with both the ZX81 and the ZX Spectrum.

The cased keyboard, mesuring 9 inches by 15 inches by $2\frac{1}{2}$ inches, includes 52 keys, 12 of which are used for the numeric keypad. The actual case is coloured black while the keys are grey and red.

To install the computer inside the case, the micro must be taken from its original casing — however, the keyboard case has been customised for easy fitting. There is also room for the power supply and additional RAM packs should you be using the ZX81.

All the connections usually found at the back of your computer are faithfully reproduced at the back of the keyboard case for easy access.

Priced at £45 inclusive, you can find more details on the keyboard case from dK'tronics, Unit 2, Shire Hill Industrial Estate, Saffron, Walden, Essex CB11 3AX. You can always 'phone them on 0799 26350.



Custom Key Panel Kits — Softeach

You can now customize your keyboard to suit all the different pieces of software you use.

For example, in some games the keys you need to press to move right and left are often the '8' and '5' keys respectively — however, as you all know, other games can be completely different and require a staggering number of keys to properly play the game. With this kit, you can now place a card over the keys and using sticky labels create uncomplicated guides for your different software packages.

Softeach provide 10 overlays and two sheets of sticky labels, one already printed with words like 'left', 'right', 'lasers', 'fire', 'keypanel for:', etc, and the other left blank for you to make up your own labels.

The Custom Key Panel Kits are priced at £3.95 a pack. You can get more information from Softeach Ltd, 25 College Road, Reading, Berks RG6 1QE.

Tactile Keyboard – Steatite Insulations

This keyboard, for the ZX81, incorporates full-travel keys and provides the professional mechanism for proper touch typing.

The case has a low profile and the keys are angled to ease typing. A full complement of legends is supplied for the ZX81 with clear plastic inserts so that the legends remain intact over a long life.

Full instructions are provided as to how the unit is fitted. You can obtain this keyboard for £30.95 from Steatite Insulations Ltd, Hagley House, Hagley Road, Birmingham B16 8QW. Telephone enquiries can be made on 021-454 6961.

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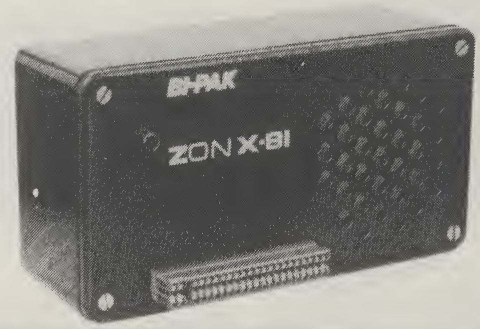
Speech

ZONX-81 – Bi-Pak Semiconductors ▼

The ZONX-81 is compatible with all Sinclair computers, although for the Spectrum an adaptor is required; this can be bought separately for £6.80 if you are upgrading from '81 to Spectrum.

The unit offers a wide range of sound effects, such as pianos, bells, helicopters, lasers, explosions, etc. The sound chip used has been designed so that the pitches and volumes of the three channels and overall attack/delay envelope can be controlled by BASIC statements.

The ZX81 version of the device is priced at £25.95 and the Spectrum model comes complete with adaptor at £32.75. Details of these units are available from Bi-Pack Semiconductors, PO Box 6, Ware, Herts or by telephoning on 0920 3442.



S-Pack – DCP Microdevelopments ▼

This is an upgrade of the Digitalker, an old speech unit for the ZX81. Now designed for the Spectrum, you can get hold of the S-Pack for £49.95.

The unit comes supplies with a vocabulary of 71 words, phrases numbers and letters. These can be called from programs using simple BASIC statements.

Should you get bored or feel confined with this collection of speeches, you can always purchase one of DCP's other three Word Packs, priced at £14.95, which come as ROMs.

Further details on the S-Pack are available from DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX. And if you 'phone them on 0603 712482, you might like to ask them about their Interspec unit which provides an expansion bus for the Spectrum.

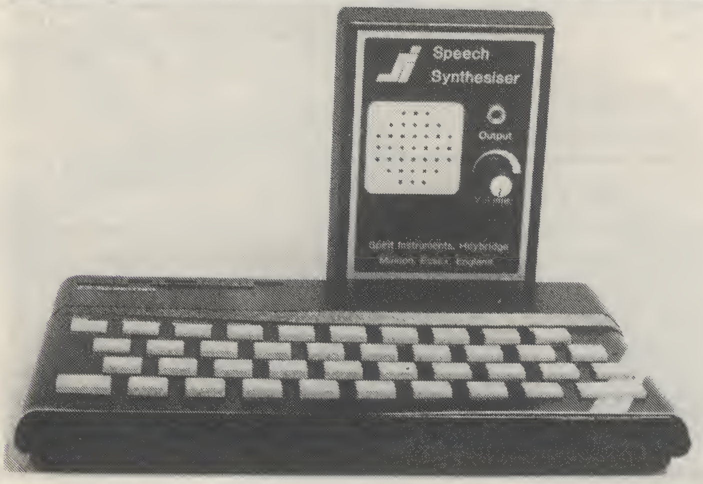
Speech Synthesiser – Spirit Instruments ◄

A speech synthesiser for the ZX Spectrum is available from Spirit Instruments.

Measuring only 3½ by 5¾ by 1 inches, the unit provides speech by building up individual sounds until you make complete words and sentences. The unit plugs into the rear connector of the Spectrum and provides sound through a speaker in the front of the unit. Although adequate for most applications, should you want the sound any louder you can always take an output from the unit to an external audio hi-fi.

With the unit, you get a guide as to how to form most sounds, but of course it's up to you to find the best ones!

For more information, contact Spirit Instruments, Heybridge, Maldon, Essex.



In . . . . Brief

- Big Ears and the Chatterbox are two sound devices developed for the ZX Spectrum. Using the Big Ears package, priced at £49, you can teach your micro to recognize individual words. The Chatterbox system is a nice solid box with speaker built in allowing you to build up phonemes to create words. This unit is priced at £49. For more information contact William Stuart Systems, 44 Bedford Gardens, London W8 7EH.

- Trichord is a plug-in music and sounds peripheral for the Spectrum and ZX81. Priced at £24.95 and £26.95 for the ZX81 and Spectrum versions respectively, the unit incorporates a PROM which holds many music and sound effects. Further details are available from Petron Electronics, Courtlands Road, Newton Abbot, Devon TQ12 2JA or by telephoning 0626 62836.

- There are two units available from Timedata called the ZXM Sound Box and the ZXS Speech Synthesiser, priced at £29.95 and £32.50 respectively. These units are compatible with both the ZX81 and ZX Spectrum. For further information get in touch with Timedata Ltd, 16 Hemmells, Laindon, Basildon, Essex SS15 6ED. Telephone enquiries can be made on 0268 418121.

- From Micro Power comes the Spectrum Add-on, priced at £19.95. The board, once connected, provides three channel sound effects, includes a 2 Watt amplifier and loudspeaker to amplify the effects, and has room on-board for two joysticks. These joysticks can be purchased for £7.45 each. For more details contact Micro Power Ltd, 8/8A Regent Street, Chapel Allerton, Leeds LS7 4PE or telephone 0532 683186.

- Fuller Micro offer three units which offer various voice synthesis and sound effects. These are the Orator, priced at £39.95; the Fuller Box, priced at £29.95; and the Master Unit, incorporating the features of the other two and priced at £54.95. More details are available from Fuller Micro Systems, The ZX Computer Centre, Dale Street, Liverpool 2.

- The Sweet Talker, available for £34.95, is designed to provide speech synthesis for the ZX81 and ZX Spectrum. The package comes complete with demonstration cassette and instructions on how to use the allophone system. More details can be obtained from Cheetah Marketing Ltd, 359 The Strand, London WC2R 0HS or by 'phone on 01-240 7939.

- With automatic key voicing, Microdrive compatibility comes the MicroSpeech unit at a cost of £29.95. Designed for the Spectrum, the device allows you to build up words using individual sounds. Find out more from Currah Computer Components Ltd, Graythorp Industrial Estate, Hartlepool, Cleveland.

In . . . . Brief

- Voltmace are providing a new joystick system to the market. Their joysticks for the Spectrum or ZX81 will be available at £5.95 each. There is also a programmable interface which with the complementary software means you can program the joysticks to any keys of the micro. The programmable interface is priced at £24, although if you buy interface and joysticks together you will only pay £27.50. More details are available from Voltmace Ltd, Park Drive, Baldock, Herts SG7 6EW. Telephone enquiries can be made on 0462 894410.

- Available from Addpac Electronics is the Addpac JS11 joystick and interface for the Spectrum. Complete with demo program, this package is priced at £18.99 all inclusive. For more information get in touch with Addpac Electronics, 22 Watling Street East, Towcester, Northants NN12 7AF.

- The Pickard Controller is a device allowing you to connect any Atari-type joystick to the ZX81 or Spectrum. The unit also allows you to specify which keys the joystick is to emulate. The price of the Pickard Controller is £20.45, and if you want to buy joysticks from them, you'll have to pay £7.50 each. For further details contact Success Services, 154 High Street, Bloxwich, Walsall, West Midlands WS13 3JT.

- Electrotech have produced a boxed joystick with three large push button controls which smacks of the 'real' arcade machines. Priced at £43.70, the unit contains a 2K RAM pcb and plugs directly in the rear of the Spectrum. If you want to find out more about this device contact Electrotech at 2 Heath Close, Winston Hill, Luton, Beds or telephone them on 0582 429809.

- The Protek interface unit provides the Spectrum with access to any Atari-type joystick. Priced at £14.95, the unit simply plugs into the back of the computer. For further details get in touch with Protek Computing Ltd, Clydeside Bank Building, High Street, South Queensferry, Edinburgh EH30 or 'phone 031-331 4400.

- The Analogue Input device from Midwich comes as a kit to be made up and is priced at £22.95. Provision is made for two joysticks and the unit simply plugs into the back of the Spectrum. Midwich also make available joysticks at a price of £7.99. Further information is obtainable from Midwich Computer Company Ltd, Rickinghall House, Rickinghall, Suffolk IP22 1HH.

Joysticks

Competition Pro Joystick – Kempston ▼

The Kempston Competition Pro Joystick is certainly a solid looking joystick constructed from steel and strong nylon.

With a self-centering stick, the joystick permits movement in eight directions and has two large 'fire' buttons (for left- and right-handed operation). Although compatible with many games on the market, Kempston offer three software packages from Kempsoft which allow even more games to be played with their joystick.

Priced at £25 for interface and joystick, you can find out more about these joysticks from Kempston Micro Electronics, 180A Bedford Road, Kempston, Bedford MK42 8BL or you can telephone them on 0234 852997.

Programmable Joystick Interface – AGF Hardware

Upgrading the Interface Module II comes the Programmable Joystick Interface at £32.95 which is claimed to be compatible with all software.

Plugging into the back of either the ZX81 or Spectrum, using quick clip-on connections you can define which of the 40 Spectrum keys you would like simulated by the joystick. Also included with the package is a quick reference card which outlines the connections you'll need to make for ten of the most popular games.

As with the Interface II model, this interface is compatible with Atari-type joysticks; two sockets are available. With every order, you will also receive a demonstration program called Video Graffiti which shows you how to implement the joysticks right away.

For further details get in touch with AGF Hardware, 26 Van Gogh Place, Bognor Regis, West Sussex PO22 9BY or 'phone 0243 823337.

Triga Command – Datal Electronics ◄

The Triga Command looks as though it might be the shape of things to come.

From the States, the real home of the arcade game, comes this rugged joystick, with a firing button in just the right place to 'kill' all those aliens. The internal moving parts are made of solid nylon rather than plastic so that it should be stronger.

The joystick comes complete with an interface unit so that it can be plugged into the Spectrum. Triga Command is priced at £19.95 for interface and joystick complete.

For more information talk to the people from Datel Electronics on 0782 273815 or write to 27 Hope Street, Hanley, Stoke on Trent.

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In . . . . . Brief

● Dean Electronics have introduced a new style printer to the market based on the American version of the Sinclair printer. Designated the Alphacom 32 and priced at £99.95, the new printer can be utilised with both the Spectrum and ZX81. Using 4½ inch wide paper, the printer prints at 32 characters per second. The unit incorporates a built-in interface which accepts the BASIC keywords such as COPY, LLIST and LPRINT, and will also print user-defined graphics. For further details get in touch with Dean Electronics Ltd, Glendale Park, Fernbank Road, Ascot, Berkshire or telephone 0344 885661.

● A tape loader from Elinca Products should help you LOAD and SAVE programs when using the ZX81. The ZX Tapeloader filters and stabilises the signals in both directions, providing a signal perfectly matched for the computer. The unit also incorporates an audio output indicator and signal amplifier to enable you to correct the input signal. Further details on the ZX Tapeloader are obtainable from Elinca Products Ltd, Lyon Works, Capel Street, Sheffield S6 2NL or by 'phoning 0742 339774.

● Suitable for the 16K or 48K Spectrum comes the Prism VTX 5000, a modem which puts you in touch with Micronet 800, the huge database of information, software and other users. Using this device you can choose from hundreds of free games, educational and business packages, access the whole range of Prestel information and keep in touch via electronic mail with any other Micronet 800 or Prestel user. The Prism VTX 5000 modem is priced at £99.95 and is available from Micronet 800, Scriptor Court, 155 Farringdon Road, London EC1R 3AD or you can 'phone them on 01-278 3143.

● If you're experiencing loading problems on your ZX81 you may like to consider to Z-Dubber, a loading aid from the States. The device interfaces between the cassette recorder and the micro, and the sound is boosted before it reaches the ZX81. You can also connect the Z-Dubber between two recorders to get good back-up program storage. The unit is priced at $29.95 and is available from Bytesize Computer Products, PO Box 21123, Seattle, WA 98111, USA.

● The ZX99 Automatic Tape Controller, priced at £49.95, allows software control of up to four tape recorders, automatic tape copying and tape block skip without destroying the contents of RAM. The device also provides an RS 232 interface for the ZX81. For more details, contact Data-assette, 44 Shroton Street, London NW1 or telephone 01-258 0409.

Adding on

Executive Case – Treetop Designs

Specifically designed for the Spectrum, this ABS plastic case combines the features of an executive case allowing you to carry your equipment around with you, and also as a console on which to work on.

The console features a raised and inclined support for the Spectrum and a secure housing is provided for the power pack giving access to the air for circulation. There is also room for a printer, cassette recorders and internal wiring. An off/on switch and LOAD/SAVE switch are also provided.

Six cassettes and spare printer paper may also be stored in the unit, and the lid, as well as room for storing leads, comprises a soft foam cushion to keep the equipment secure in transit.

The whole package is priced at £47.45 and is available from Treetop Designs, 61 Widmore Road, Bromley, Kent. They are also working on a new design to incorporate storage of the Microdrives, and they will be able to convert the old version case to be able to carry the Microdrives.

RAMLOK – Adapt Electronics

If you suffer from an unreliable RAM pack connection on your ZX81 you may like to consider a RAMLOK kit.

Consisting of a high quality, gold plated male connector which replaces the computer connector, and a mechanical clamping device, the RAM pack is clamped to the computer securely. No drilling, soldering or special tools are required to carry out this modification. Suitable for connection to most popular RAM packs, the RAMLOK kit is priced at £7.50.

There are also a series of RAMLOK II adaptors which stop the 'RAM pack wobble' syndrome and provide an improved quality edge connector for the computer. This kit is available for the Spectrum and the ZX81 and is priced between £2.50 and £6, depending on the machine and what modifications you wish to make.

For more details speak to the people at Adapt Electronics, 20 Starling Close, Buckhurst Hill, Essex IG9 5TN or 'phone them on 01-504 2840.

Desk Console – Traffic Technology ◀

For the ZX Spectrum, here is a desk console constructed from heavy gauge, black ABS plastic with a detachable base cover and non-slip feet.

On board the console, there is room for the Spectrum, power supply, Sinclair Printer, RS 232 interface, joystick control, two Microdrives, cassette recorder, cassettes and pencils, etc. There is also a built-in switch which means that you don't have to alter the leads when you are LOADing and SAVEing.

The price of the device is £42.18 and is available from Traffic Technology Ltd, PO Box 2, Warminster, Wiltshire BA12 7QX.

Computer Desk – PH Scientific Products ▲

PH Scientific Products have available a computer desk made from ABS plastic for both the ZX Spectrum and ZX81.

With recesses for the computer and printer, there is also support for a television to rest on top of the unit. The power supply and untidy wiring can be safely hidden from view.

The price of the Spectrum version is £16 and £1 less for the ZX81 computer desk. For further details get in touch with PH Scientific Products, 9 Southfield, Welwyn Garden City, Herts or 'phone 07073 20241.

In . . . . Brief

● If you're having problems with your mains voltage when you're using your Spectrum and ZX81, the Battpack may be the answer. The device comprises a rechargable 9V Ni-Cad battery pack and transient suppressor, housed in a similar casing to the Sinclair Power Pack. The Battpack ensures that the voltage into your ZX81 and Spectrum never drops below 9V, thereby eliminating program crash through voltage problems. Priced at £13.95, you can find out more from Adaptors and Eliminators Ltd, 14 Thames Street, Louth, Lincs.

● Kelwood Computer cases have been busy providing stands for the Spectrum and ZX81. The Wobble Stopper comes in three models, small, tilted and large, and can be used with the ZX81 to stop the 'RAM pack wobble' syndrome as they clamp the RAM pack to the micro. These units are priced from £5.25 to £6.75. For the ZX81 and Spectrum, there is the Power Base, which holds the micro firmly in place while you use it. The price of these devices are £13 for the ZX81 and £13.50 for the Spectrum version. For more information, you could contact Kelwood Computer Cases, Kelwood Heating Ltd, Downs Row, Moorgate, Rotherham S60 2HD, or telephone 0709 63242.

● Easily adapted for a variety of uses comes the BEEP Amp from Hypnotech. The device comprises an 8 Watt amplifier with a 10 Watt woofer and tweeter in a small speaker unit. The unit is mains operated and plugs into the MIC socket of the Spectrum. Priced at £23.95, you can find out more about this device from Hypnotech, 3 West Vale, Neston, South Wirral L64 9SE.

Monicron – MacQuillan Electronics

Designed to assist users by providing a convenient, consistent means of loading and saving programs on tape, the Monicron is priced at £15.95.

The Spectrum model has a built-in amplifier, while both ZX81 and Spectrum models feature a power on/off switch. All functions are performed without the need to disconnect or swap plugs. The internal, high quality components are contained in a purpose-built, injection moulded case to form a small, compact unit.

Also available is an 'enhanced' Spectrum model containing a 2 Watt amplifier and external socket for connecting a larger, audio type speaker. The price for the 'enhanced' model is £16.75.

For further information contact MacQuillan Electronics, 72 Mere Road, Wigston Magna, Leicester LE8 1RL.

High Resolution Graphics Pack – Digital Integration ▲

This accessory for the ZX81 gives a full 256 by 192 pixel display, with full dynamic control of every pixel in BASIC.

A 2K EPROM contains the Hi-res BASIC monitor offering a range of powerful commands such as PAGE, PLOT and SCROLL, which can be used for defining your own characters, drawing lines, plotting complex functions, and a complete lower case character set for word processing.

The pack is compatible with the Sinclair Printer, and comes complete with a comprehensive handbook illustrating how you can get the best from the device.

The unit is priced at £38.95, although there is an opportunity for schools to arrange for a discount. For more details get in touch with Digital Integration, 22 Ash Church Road, Ash, Aldershot, Hants GU12 6LX.

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In . . . . Brief

● If you want to tidy up the wiring you accumulate around the ZX81 or Spectrum, there is a large black tray and stand which you can get from Computerlock for £31.50. With room to stand a television on top of the stand, the computer sits comfortably with all the trailing wires tucked away inside the unit. Further information is obtainable from Computerlock, 2 Wychperry Road, Haywoods Heath, West Sussex RH16 1HJ. Telephone enquiries can be made on 0444 451986.

● In the cheaper end of the console market comes a cardboard unit from Print 'n' Plotter Products. Priced at £8.25, this cardboard stand provides room for a Spectrum, power supply and printer. The package has to be made up, but this is quite simple with the instructions provided. Although not room for peripherals, modifications can easily be made due to the texture of the vinyl-covered box. For more details contact Print 'n' Plotter Products, 49 Borough High Street, London SE1 9SE.

● The Micro-Myte 60 acoustic modem, priced at £48, provides a low cost means of communicating information between compatible micros utilising the telephone network. The device can be used with the 48K Spectrum and the ZX81, and the menu-driven software provides transmission of either complete programs, defined areas of memory or complete screen contents. For more information contact Micro-Myte Communications Ltd, Polo House, 27 Prince Street, Bristol 1 or telephone 0272 299373.

● Hi-Stak is an add-on which has been designed to stick on the base of the ZX81 or Spectrum to tilt the keyboard giving the user better access to the keyboard. Comprising two injection moulded ABS ramps with built-in rubber feet, they are available for £3.95. More information is obtainable from Warp Factor Eight, 6 Pelham Road, Braughing, Ware, Herts SG11 2QU or by 'phoning 0920 821841.

● The Stabiliser Pad has been designed to keep your ZX81 from flying across the desk as you try and key your programs in. Made from a strong rubbery substance, the pad holds ZX81 and RAM pack securely. You can get one of these units from Stream Computers, PO Box 113, Ajax, Ontario L1S 3C5, Canada, for £4.50.

● Aimed at the business user eager to impress is a custom case for the Spectrum and all its associated peripherals. Looking very much like an executive case, all the equipment is housed in small compartments of shock absorbent foam. Priced at £34.95, you can get further details from Computex Cases, Stanhope Road, Camberley, Surrey GU15 3PS.

● From RD Laboratories you can get a very sophisticated drawing instrument for the Spectrum. Using the cassette full of software provided with the package, you can get the Digital Tracer to plot individual points, draw lines, alter the background and foreground colours, shading, printing and editing text on the screen. There is also a co-ordinates program and one that allows you to draw at a very fast speed. Priced at £49.95, further information can be obtained from RD Laboratories, Unit 20, Court Road Industrial Estate, Cwm Barn, Gwent NP44 3AS.

● A Spectrum workstation is available from Peter Furlong Products made from durable ABS plastic and priced at £16. There is a slot for the Spectrum and the associated wires are hidden away; space on top of the unit is provided for the television. LOAD/SAVE switches, speaker units and an alloy base are provided for a small extra charge. More details can be obtained from Peter Furlong Products, Unit F, South Coast Road Industrial Estate, Peacehaven, East Sussex BN9 8NA.

BEEP Booster – Compusound

The Telesound BEEP Booster is an upgrade of the Telesound 84 unit; the new unit can be fitted not only to the issue two Spectrum, but also to the issue three Spectrum.

The BEEP Booster allows you to amplify the sound from your Spectrum through the television speaker so that you can really make the most of the more 'noisy' programs available on the market. Measuring only 2cm by 1.2cm by 1cm, it is claimed to be the smallest modulator in the world.

The BEEP Booster is connected inside the Spectrum via miniature plated clips which push onto the connection points. For more information on the BEEP Booster 'phone 0527 21439 or write to Compusound at 32 Langley Close, Redditch, Worcester B98 0ET.

Victagraph – Victa Ceramics

If you find you need some help with the PLOT, CIRCLE and DRAW commands on your Spectrum, you may find some solace in the package from Victa Ceramics.

Comprising a white plastic base sheet, a clear plastic offset co-ordinate window, a clear plastic calibrated window and a clear plastic window mask with a plot sight in each corner, the Victagraph also includes a test design, comprehensive instructions and a number of sticky patches.

Using the various window masks over a test design, the mask will hide all the unwanted co-ordinates leaving you with the required figures.

The price of the Victagraph package is £7.50, but for more information contact Victa Ceramics, 6A Bow Street, Rugeley, Staffordshire or telephone 08894 2426.

Microcase – Micro Aids

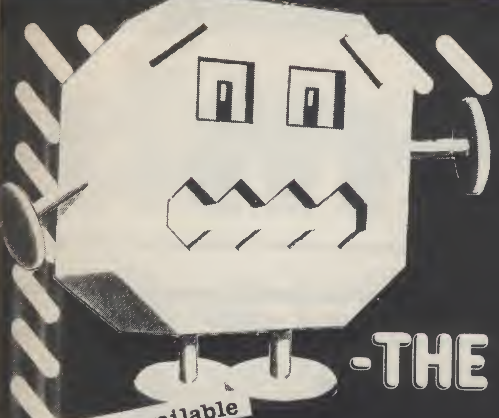
The Microcase is just one of the products available from Micro Aids.

The Microcase, designed for both the Spectrum and ZX81, is an executive style case with a fully detachable lid. The inside is filled with foam to secure the equipment, and can contain the computer, cassette recorder and cassettes, power pack, printer and leads. The price of the Microcase is £32.95.

There is also a workstation available, which has space for a Spectrum, cassette/Microdrive and monitor. This unit is priced at £22.95.

You could also ask them about their Spectrum Planning Aids, Dust Covers and various other devices.

For more information contact Micro Aids, Distribution Centre, Beech House, Hob Hey Lane, Culcheth, Warrington, Cheshire WA3 4LN. Telephone enquiries can be made on 092-576 2613.



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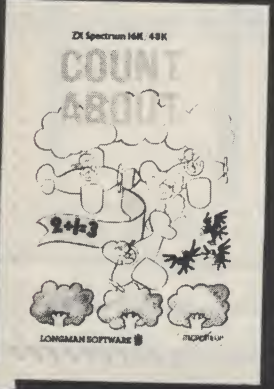

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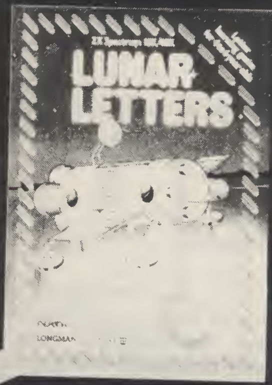
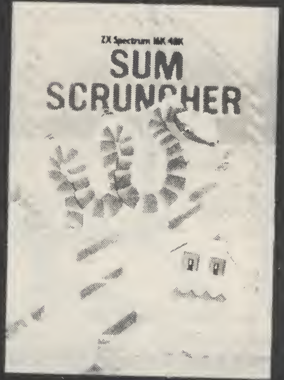
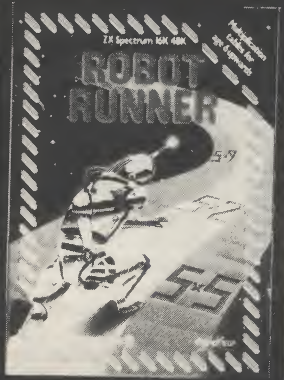


Maths Practice 6yrs+ £7.95
ZX Spectrum 16k/48k



Tables Practice 6yrs+ £7.95
ZX Spectrum 16k/48k



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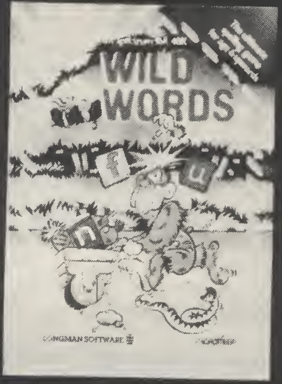

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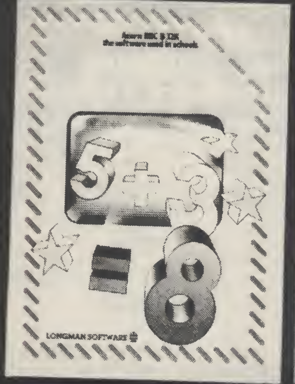

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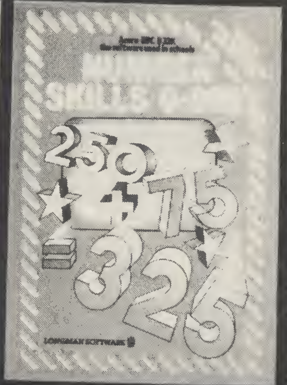

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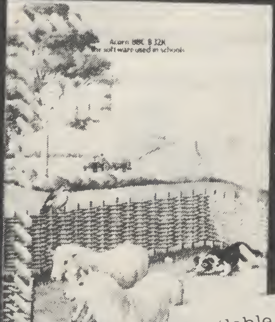
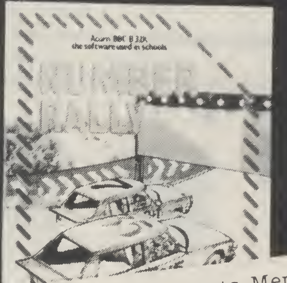


Practice in number skills 4-8yrs £9.95 BBC B



Available from W. H. Smith, Boots, Menzies, other leading chain stores and computer shops. Trade availability: Webster's Software Directory/Prism Microproducts/Lightning. In case of difficulty, or for a full colour catalogue, write to **Division G827 (Software) Longman Group Ltd Burnt Mill Harlow Essex CM20 2JE**

LONGMAN SOFTWARE

Time bomb

Can you save the city from the hidden time bomb – a great program for your 16K ZX81 from Oliver Fritsch of West Germany.

Somewhere in the city, a time bomb has been hidden which is due to detonate in a very short time. It's up to you to find and defuse the bomb before it goes off and devastates the city.

When you RUN this program, you will first be greeted with an aerial view of the part of the city your intelligence people tell you the bomb is cached in. In this area of the city you will see a number of buildings the time bomb might be hidden in. You move your character, an asterisk, using the direction keys on the ZX81 — the '5', '6', '7' and '8' keys.

When you touch one of the houses with your character, you will be provided with another aerial view – this time of the house you are preparing to search. The bomb is represented by an inverse 'BB' character and you should head for it, again using the direction keys. If the house you have entered does not contain the bomb, you will have to exit the house as quickly as you can via the inverse 'A' character and move onto another house to continue your search.

Time and motion

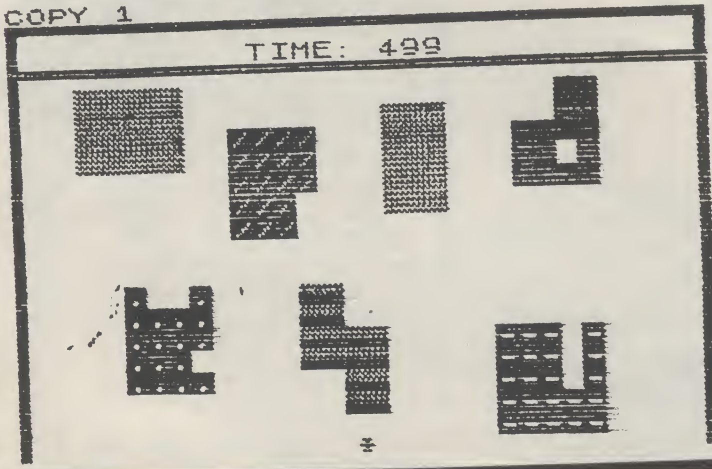
Once you have found the time bomb, you should move your character onto that square. Be careful not to bump into any of the walls of the house or it will be taken to mean that you have bumped your head, thus rendering yourself unconscious, and you will lose valuable time points When you touch the bomb, you will be given the final screen which shows your character standing by the time bomb.

The fuse of the bomb, shown as an inverse 'Z', moves inside the bomb from top to bottom. All you have to do is to shoot at the fuse, using the '8' key, to render it harmless. Don't worry if you don't manage to defuse the bomb with your first shot as you'll have three goes. Should you want to give yourself a better chance of hitting the fuse, you could always change the number '3' in line 9126.

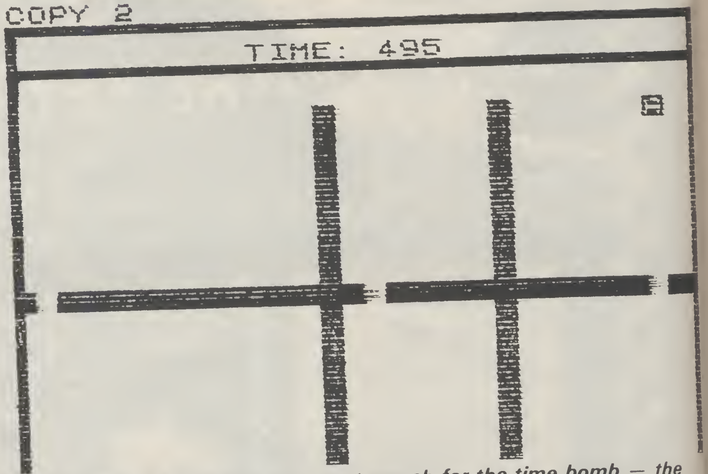
Once you have defused the bomb, you will be presented with your own score and the current highest score. But don't hang around – remember that time is of the essence!

Your first view of the city from above. Your guest is to find out which building contains the bomb.

COPY 1

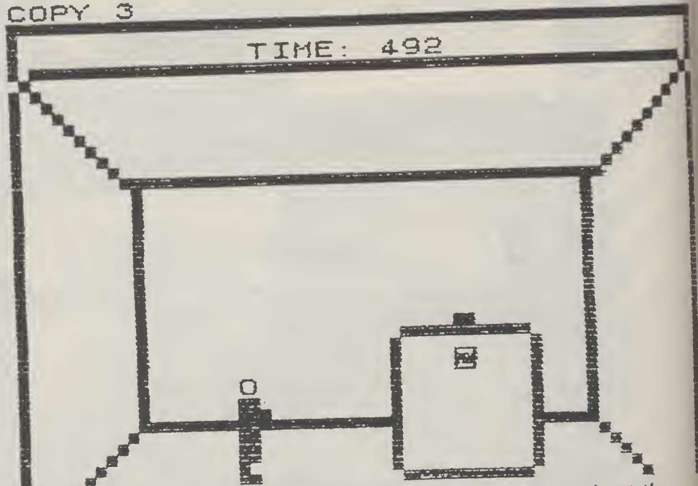


COPY 2

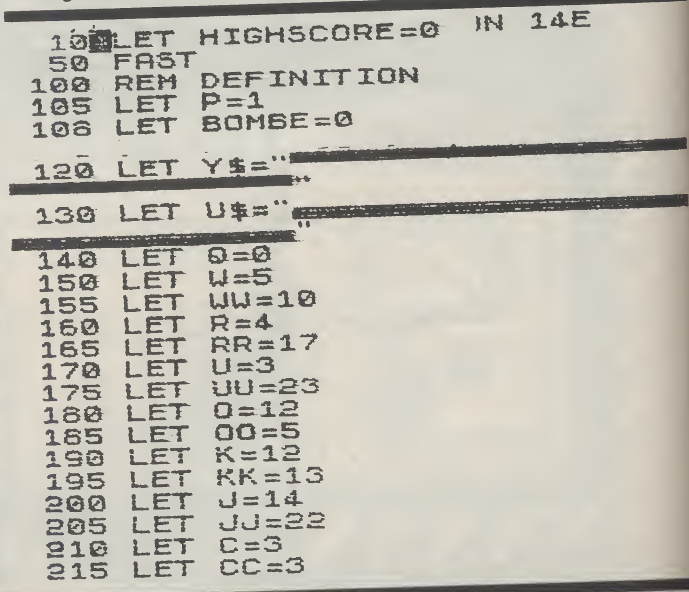


Once inside the building, you must search for the time bomb — the exit is denoted by an inverse 'A' character.

COPY 3



You have found the bomb! Now all you have to do is to shoot the moving fuse, which is denoted by the inverse 'Z' character.



```
  10 LET HIGHSCORE=0   IN 14E
  50 FAST
 100 REM DEFINITION
 105 LET P=1
 106 LET BOMBE=0
 120 LET Y$="
"
 130 LET U$="
"
 140 LET Q=0
 150 LET W=5
 155 LET WW=10
 160 LET R=4
 165 LET RR=17
 170 LET U=3
 175 LET UU=23
 180 LET O=12
 185 LET OO=5
 190 LET K=12
 195 LET KK=13
 200 LET J=14
 205 LET JJ=22
 210 LET C=3
 215 LET CC=3
 220 LET II=11
 225 LET III=52
 230 LET RA=0
 250 LET K$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒"
 260 LET NM=0
1005 LET MK=0
1010 CLS
1015 SLOW
1018 PRINT TAB 3;"**************
************"
1020 PRINT TAB 3;"****  FIND  TH
E BOMB  ****"
1025 PRINT TAB 3;"**************
************"
1260 PRINT ,,"WHICH LEVEL?";TAB
32;"------------------------------
--"
1270 PRINT AT 7,4;"▣ BEGINNER";A
T 9,4;"▣ AMATEUR";AT 11,4;"▣ EXP
ERT"
1280 PRINT AT 18,4;"(PRESS KEY)"
1300 PRINT AT 21,4;"C 1983  BY O
LIVER FRITSCH"
1350 IF INKEY$="1" THEN GOTO 200
0
1355 IF INKEY$="2" THEN GOTO 202
0
1360 IF INKEY$="3" THEN GOTO 204
0
1370 IF INKEY$="" THEN GOTO 1350
2000 LET ZEIT=500
2010 GOTO 5000
2020 LET ZEIT=400
2030 GOTO 5000
2040 LET ZEIT=300
2050 GOTO 5000
5000 REM DRAW ROOM
5002 CLS
5005 FAST
5006 POKE 16418,0
5020 PRINT AT 0,0;Y$;AT 2,0;Y$;A
T 23,0;U$
5060 FOR I=1 TO 22
5070 PRINT AT I,0;"▐";AT I,31;"▌
"
5090 NEXT I
5095 PRINT AT 0,0;"▛";AT 0,31;"▜
";AT 23,0;"▙";AT 23,31;"▟"
5096 PRINT AT 2,0;"▛";AT 2,31;"▜
"
5100 PRINT AT 1,11;"TIME: ";ZEIT
5120 IF RA=2 THEN GOTO 8120
5121 IF RA=1 THEN GOTO 7120
6000 REM TOWNPLAN
6100 PRINT AT C,CC;"▒▒▒▒▒";AT C+
1,CC;"▒▒▒▒▒";AT C+2,CC;"▒▒▒▒▒";A
T C+3,CC;"▒▒▒▒▒"
6110 PRINT AT U,UU;"▒▒▒▒";AT U+1
,UU;"▒▒▒▒";AT U+2,UU;"▒▒▒▒";AT U
+3,UU;"▒▒▒";AT U+4,UU;"▒▒▒"
6120 PRINT AT R,RR;"▒▒▒";AT R+1,
RR;"▒▒▒";AT R+2,RR;"▒▒▒";AT R+3,
RR;"▒▒▒";AT R+4,RR;"▒▒▒"
6130 PRINT AT U,UU;"  ███";AT U+1
,UU;" ██ ";AT U+2,UU;"█████";AT U
+3,UU;"██ █";AT U+4,UU;"█████"
6140 PRINT AT O,OO;"█ █";AT O+1
,OO;"████";AT O+2,OO;"████";AT O
+3,OO;"███ ";AT O+4,OO;"████"
6150 PRINT AT K,KK;"▒▒  ";AT K+1
,KK;"▒▒  ";AT K+2,KK;"▒▒▒▒▒";AT K
+3,KK;"▒▒▒▒▒";AT K+4,KK;"  ▒▒";AT
 K+5,KK;"  ▒▒"
6160 PRINT AT J,JJ;"███ █";AT J+
1,JJ;"███ █";AT J+2,JJ;"████ █";A
T J+3,JJ;"██████";AT J+4,JJ;"█████
█"
6200 SLOW
6300 REM HIDE BOMB
6310 IF NM=0 THEN LET X=INT (RND
*30)+1
6315 IF NM=0 THEN LET Y=INT (RND
*18)+4
6330 PRINT AT Y,X;
6340 LET P=PEEK (PEEK 16398+256*
PEEK 16399)
6350 IF P=CODE " " OR P=CODE "*"
 OR P=CODE "▒" THEN GOTO 6310
6400 REM MOVING
6420 LET MU=15
6425 LET MO=20
6427 LET A$=INKEY$
6428 PRINT AT MO,MU;" ";
6430 LET MU=MU+(A$="8")-(A$="5")
6440 LET MO=MO+(A$="6")-(A$="7")
6450 PRINT AT MO,MU;
6455 LET Q=PEEK (PEEK 16398+256*
PEEK 16399)
6456 IF Q=P THEN LET BOMBE=1
6460 IF Q<>0 THEN GOTO 7000
6465 PRINT AT MO,MU;"*"
6495 LET ZEIT=ZEIT-1
6497 PRINT AT 1,17;ZEIT
6498 IF ZEIT=000 THEN GOTO 9500
6500 GOTO 6427
7000 REM DRAW ROOMS
7100 LET RA=1
7102 LET NM=1
7103 CLS
7105 GOTO 5005
7130 REM WALLS
7135 LET RA=0
7150 LET WE=INT (RND*13)+5
7160 LET WC=INT (RND*15)+4
7200 PRINT AT WE,0;K$
7210 PRINT AT WE,1;" ";TAB WE+4;
" ";TAB 29;" "
7220 FOR I=4 TO 21
7230 PRINT AT I,WC;"█";TAB 22;"█
"
7240 NEXT I
7300 PRINT AT WE,1;" ";TAB WE+4;
" ";TAB 29;" "
7310 PRINT AT 20,3;"*";AT 4,29;"
▣"
7320 IF BOMBE=1 THEN PRINT AT Y,
X;"▣▣"
7350 SLOW
7360 LET MU=3
7370 LET MO=20
7380 PRINT AT MO,MU;" ";
7385 LET A$=INKEY$
7390 LET MU=MU+(A$="8")-(A$="5")
7400 LET MO=MO+(A$="6")-(A$="7")
7410 PRINT AT MO,MU;
7420 LET Z=PEEK (PEEK 16398+256*
PEEK 16399)
7430 IF Z=CODE "▣" THEN GOTO 800
0
7440 IF Z=CODE "▣" THEN GOTO 500
0
7442 IF Z=CODE "█" THEN GOTO 760
0
7445 PRINT AT MO,MU;"*"
7450 LET ZEIT=ZEIT-1
7455 PRINT AT 1,17;ZEIT
7460 IF ZEIT=000 THEN GOTO 9500
7490 GOTO 7380
7500 STOP
7600 CLS
7605 LET RT=INT (RND*50)+10
7610 PRINT ,,"YOU BUMP YOUR HEAD
 AT THE WALL."
7620 PRINT ,,"YOU WERE UNCONSCIO
US FOR ";RT
7625 PRINT ,,"TIME UNITS."
7630 LET ZEIT=ZEIT-RT
7800 PAUSE 300
7900 GOTO 7100
8000 REM RENDER HARMLESS
8100 CLS
8105 LET RA=2
8110 GOTO 5005
8111 SLOW
8120 FOR I=0 TO 5
8130 PRINT AT 23-I,31-I;"▚"
8135 PRINT AT I+2,I;"▚"
```

▶

```
8160 PRINT AT I+2,31-I;"▞"
8190 PRINT AT 23-I,I;"▞"
8195 NEXT I
8196 FOR I=8 TO 29
8200 PLOT II,I
8210 PLOT III,I
8250 NEXT I
8260 FOR I=1 TO 41
8265 PLOT II+I,7
8270 PLOT II+I,29
8260 NEXT I
9000 REM DRAW BOMB
9010 LET B$="▐▀▀▀▀▀▀▀▌"
9015 LET O$="▐▄▄▄▄▄▄▄▌"
9020 LET V$="▐       ▌"
9025 PRINT AT 16,10;"O"
9027 PRINT AT 17,10;"▙ "
9028 PRINT AT 18,10;"█"
9029 PRINT AT 19,10;"█"
9030 PRINT AT 20,10;"▙"
9040 PRINT AT 13,20;"▀"
9045 PRINT AT 14,17;B$
9052 PRINT AT 15,17;V$
9053 PRINT AT 16,17;V$
9054 PRINT AT 17,17;V$
9055 PRINT AT 18,17;V$
9060 PRINT AT 19,17;V$
9065 PRINT AT 20,17;O$
9068 SLOW
9070 FOR I=15 TO 19
9071 IF INKEY$="8" THEN GOSUB 91
00
9074 PRINT AT I,20;"▩"
9075 PRINT AT I,20;" "
9080 NEXT I
9085 LET ZEIT=ZEIT-1
9086 PRINT AT 1,17;ZEIT
9087 IF ZEIT=000 THEN GOTO 9500
9090 GOTO 9070
9100 FOR K=12 TO 20 STEP 2
9110 PRINT AT 17,K;"*"
9111 PRINT AT 17,K;" "
9120 NEXT K
9125 LET MK=MK+1
9126 IF MK>3 THEN GOTO 9500
9130 IF I=18 THEN PRINT AT 9,7;"
CONGRATULATIONS...";AT 11,12;"YO
U""VE GOT IT"
9140 IF I=18 THEN GOTO 9610
9200 RETURN
9500 CLS
9502 FOR I=1 TO 20
9510 PRINT AT 11,12;"▩ BANG ▩"
9512 PRINT AT 11,12;"* BANG *"
9513 NEXT I
9600 GOTO 9660
9610 LET SCORE=ZEIT*5
9620 PRINT AT 23,2;"SCORE:  ";SCO
RE
9622 IF SCORE>HIGHSCORE THEN LET
 HIGHSCORE=SCORE
9625 PRINT AT 23,15;"HIGHSCORE:
";HIGHSCORE
9650 PAUSE 500
9660 CLS
9670 PRINT ,,TAB 9;"ANOTHER GAME
?"
9680 PRINT ,,TAB 10;"""Y"" OR ""
N"""
9700 IF INKEY$="N" THEN GOTO 972
0
9705 IF INKEY$="Y" THEN GOTO 50
0
9710 GOTO 9700
9720 PRINT AT 18,11;"CHEERIO"
9800 STOP
9995 SAVE "BOMB"
9996 GOTO 1
```

ZX80 GAME

Wheeler dealer

Try playing the wheel of fortune in this game for your unexpanded ZX80 written for us by Adrian Marsh of Hampshire.

This is a very simple version of the 'wheel of fortune' type of game you have probably seen at fairs or in the old western movies on the television. Should you have more space on your computer, in terms of RAM add-ons, you will find it simplicity itself to add a line here and there.

Type the program in as published and type RUN. You will then be presented with a screen display showing the winning numbers. You are then invited to press any key to start the wheel of fortune. Once the wheel has been turned, you are told whether you have won or not and are told the numbers you got. You then press the 'S' key to spin the wheel again.

Should you have more room in memory to add a line here and there, it would be quite fun to allow the player to have a little flutter on the outcome of the spin of the wheel. You could also start the player off with a set sum and increment and decrement this total according to the success they have with the game.

```
10   PRINT "******** WHEELER DEALER ***********"
20   PRINT "HERE ARE THE WINNING NUMBERS"
30   PRINT
40   PRINT "-,-,9"
50   PRINT "2,2,2"
60   PRINT "5,2,5"
70   PRINT "5,5,5"
80   PRINT "9,5,9"
90   PRINT "JACKPOT*9,9,9"
110  PRINT
120  PRINT "PRESS A KEY TO START THE WHEEL"
130  INPUT A$
140  IF A$<"M" OR A$>"M" THEN GOTO 150
150  STOP
160  CLS
170  LET B=RND(9)
180  LET C=RND(9)
190  LET D=RND(9)
200  IF B>5 OR B<5 AND C>5 OR C<5 AND D=9 THEN
     GOTO 500
210  IF B=2 AND C=2 AND D=2 THEN GOTO 500
220  IF B=5 AND C=2 AND D=5 THEN GOTO 500
240  IF B=5 AND C=5 AND D=5 THEN GOTO 500
250  IF B=9 AND C=9 AND D=9 THEN GOTO 600
260  PRINT "UNFORTUNATELY YOU HAVE WON £0"
270  PRINT
280  PRINT "YOUR NUMBERS WERE ";B;C;D
290  GOTO 700
500  PRINT "YOU HAVE WON A PRIZE"
510  PRINT
520  PRINT "YOUR NUMBERS WERE ";B;C;D
700  PRINT
710  PRINT "PRESS S TO PLAY AGAIN"
720  INPUT B$
730  IF B$="S" THEN GOTO 10
740  STOP
```

ISL 48K ZX SPECTRUM

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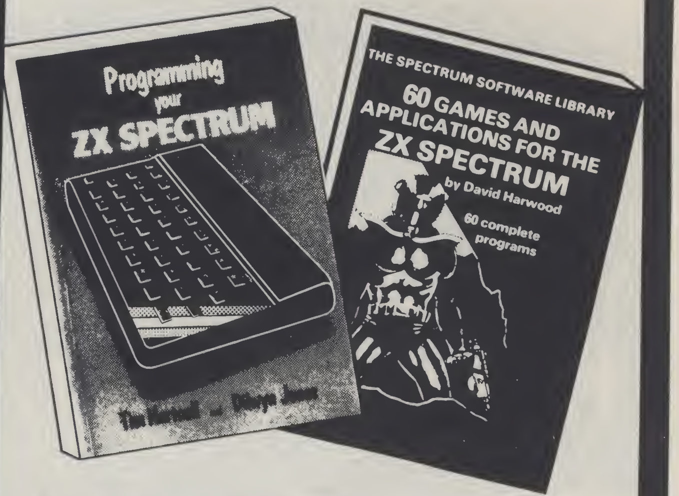
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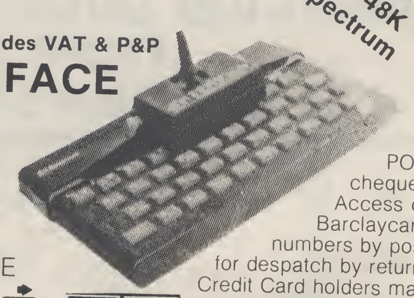

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When a horse has won, you will be informed of the winner and the person who chose it; the program will also tell you if the horse had no backer. Should you wish to change the names of the horses to ones of your own, this can easily be done altering the PRINT AT statements in lines 610 to 650.

Watch out for the fences!

```
   2 REM "HORSE RACE"
   3 REM
   4 REM *** BY N.C.PEARSON ***
   6 REM
   7 REM GRAPHIC H FOR HORSE,GRA
PHIC F FOR FENCE
   8 CLS : BORDER 4: PAPER 4: IN
K 0
  10 GO SUB 467
  20 GO TO 590
  30 BRIGHT 1: CLS : PAPER 4: BO
RDER 4: INK 0
  32 REM
  33 REM *** INSTRUCTIONS ***
  34 REM
  35 CLS : PRINT AT 0,10; FLASH
1;"HORSE RACE"
  37 FLASH 0
  38 PRINT : PRINT "[illegible]
[illegible]"
  40 PRINT : PRINT "[illegible]
[illegible]": PRINT : PRINT "
[illegible]"
: PRINT : PRINT "[illegible]
[illegible]": PRINT : PRINT "[illegible]
[illegible]
  50 LET r=0: LET a=0: LET b=0:
LET c=0: LET d=0: LET e=0
```

```
  52 INPUT M$
  53 IF M$="c" OR M$="C" THEN GO
 TO 583
  56 REM
  57 REM *** TRACK ***
  58 REM
  59 CLS
  60 PRINT AT 5,0;"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀▀"
  65 PRINT AT 6,0;"1";AT 6,10;"F
";AT 6,20;"F";AT 6,29;"F"
  70 PRINT AT 7,10;"F";AT 7,20;"
F"
  75 PRINT AT 8,0;"2";AT 8,10;"F
";AT 8,20;"F";AT 8,29;"I"
  80 PRINT AT 9,10;"F";AT 9,20;"
F"
  90 PRINT AT 10,0;"3";AT 10,10;
"F";AT 10,20;"F";AT 10,29;"N"
  95 PRINT AT 11,10;"F";AT 11,20
;"F"
 100 PRINT AT 12,0;"4";AT 12,10;
"F";AT 12,20;"F";AT 12,29;"I"
 105 PRINT AT 13,10;"F";AT 13,20
;"F"
 110 PRINT AT 14,0;"5";AT 14,10;
"F";AT 14,20;"F";AT 14,29;"S"
 115 PRINT AT 15,10;"F";AT 15,20
:"F"
```

Photograph courtesy of United Artists.

```
 120 PRINT AT 16,10;"F";AT 16,20
;"F";AT 16,29;"H"
 125 PRINT AT 17,0;"████████████████████████████████"
 130 PRINT AT 2,4;"F = FURLONGS"
 135 PRINT AT 4,1;"F-"
 140 PRINT AT 4,5;"█"
 145 PRINT AT 4,10;"█"
 150 PRINT AT 4,15;"█"
 155 PRINT AT 4,20;"█"
 160 PRINT AT 4,25;"█"
 171 REM
 172 REM *** GAME ***
 173 REM
 180 LET r=INT (RND*6)+0
 185 PLOT 10,45: DRAW 0,90
 190 PLOT 230,45: DRAW 0,90
 200 IF r=1 THEN LET a=a+1: IF r
=1 THEN GO TO 250
 205 PRINT AT 6,10;"F";AT 6,20;"
F"
 210 IF r=2 THEN LET b=b+1: IF r
=2 THEN GO TO 270
 215 PRINT AT 8,10;"F";AT 8,20;"
F"
 220 IF r=3 THEN LET c=c+1: IF r
=3 THEN GO TO 285
 225 PRINT AT 10,10;"F";AT 10,20
;"F"
 230 IF r=4 THEN LET d=d+1: IF r
=4 THEN GO TO 300
 235 PRINT AT 12,10;"F";AT 12,20
;"F"
 237 PRINT AT 14,0;"5";AT 14,10;
"F";AT 14,20;"F"
 240 IF r=5 THEN LET e=e+1: IF r
=5 THEN GO TO 320
 241 REM
 242 REM *** MOVEMENT ***
 243 REM
 250 BEEP 0.03,10: PRINT AT 6,a;
"H";AT 6,a-1;" "
 255 IF a=29 THEN GO TO 348
 265 GO TO 60
 270 BEEP 0.03,14: PRINT AT 8,b;
"H";AT 8,b-1;" "
 275 IF b=29 THEN GO TO 366
 280 GO TO 60
 285 BEEP 0.03,16: PRINT AT 10,c
;"H";AT 10,c-1;" "
 290 IF c=29 THEN GO TO 386
 295 GO TO 60
 300 BEEP 0.03,20: PRINT AT 12,d
;"H";AT 12,d-1;" "
 310 IF d=29 THEN GO TO 406
 315 GO TO 60
 320 BEEP 0.03,22: PRINT AT 14,e
;"H";AT 14,e-1;" "
 325 IF e=29 THEN GO TO 426
 340 GO TO 60
 345 REM
 346 REM *** WINNER ROUTINE ***
 347 REM
 349 PAUSE 100: CLS
 350 IF V$="" OR V$="X" OR V$="x
" THEN PRINT AT 10,0;" NUMBER 1
WON BUT NO ONE BACKED  HIM": GO
TO 460
 355 PAUSE 100: CLS
 360 PRINT AT 10,0;" THE WINNER
IS NUMBER 1 COLLECT  YOUR WINNIN
GS ";V$
 365 PAUSE 100: GO TO 460
 366 PAUSE 100: CLS
 370 IF W$="" OR W$="X" OR W$="x
" THEN PRINT AT 10,0;" NUMBER 2
WON BUT NO ONE BACKED  HIM": GO
TO 460
 375 PAUSE 100: CLS
 380 PRINT AT 10,0;" THE WINNER
IS NUMBER 2 COLLECT  YOUR WINNIN
GS ";W$
 385 PAUSE 100: GO TO 460
```

```
 386 PAUSE 100: CLS
 390 IF X$="" OR x$="x" OR x$="X
" THEN PRINT AT 10,0;" NUMBER 3
WON BUT NO ONE BACKED  HIM": GO
TO 460
 395 PAUSE 100: CLS
 400 PRINT AT 10,0;" THE WINNER
IS NUMBER 3 COLLECT YOUR WINNING
S ";X$
 405 PAUSE 100: GO TO 460
 406 PAUSE 100: CLS
 410 IF Y$="" OR Y$="X" OR Y$="x
" THEN PRINT AT 10,0;" NUMBER 4
WON BUT NO ONE BACKED  HIM": GO
TO 460
 420 PRINT AT 10,0;" THE WINNER
IS NUMBER 4 COLLECT  YOUR WINNIN
GS ";Y$
 425 PAUSE 100: GO TO 460
 426 PAUSE 100: CLS
 440 IF Z$="" OR Z$="X" OR Z$="x
" THEN PRINT AT 10,0;" NUMBER 5
WON BUT NO ONE BACKED  HIM"
 450 PRINT AT 10,0;" THE WINNER
IS NUMBER 5 COLLECT  YOUR WINNIN
GS ";Z$
 460 PRINT AT 14,0;"[illegible]
ANOTHER RACE [illegible]": INPUT G$
 465 IF G$="Y" OR G$="y" THEN GO
TO 35
 466 STOP
 467 REM
 468 REM *** USER DEFINED ***
 469 REM
 480 FOR J=0 TO 7
 490 READ Q
 500 POKE USR "H"+J,Q
 510 NEXT J
 520 DATA BIN 00001100,BIN 00011
000,BIN 01111011,BIN 11111111,BI
N 10111001,BIN 10011100,BIN 0010
0100,BIN 000110110
 530 FOR J=0 TO 7
 540 READ Q
 550 POKE USR "F"+J,Q
 560 NEXT J
 570 DATA BIN 00011000,BIN 00111
100,BIN 00111100,BIN 00011000,BI
N 00111100,BIN 00111100,BIN 0001
1000,BIN 00111100
 580 RETURN
 581 REM
 582 REM *** HORSE CHOICE ***
 583 REM
 590 CLS : PLOT 0,150: DRAW 250,
0
 600 PRINT AT 2,0;" NO    NAME
    COLOUR"
 610 PRINT AT 4,0;" 1    SUPERMA
N   MOTTLED GREY"
 620 PRINT AT 6,0;" 2    FINE TR
IM   JET BLACK"
 630 PRINT AT 8,0;" 3    GOLDENT
AILS MOTTLED BROWN"
 640 PRINT AT 10,0;" 4    BREAKE
R BE  GREY/BROWN"
 650 PRINT AT 12,0;" 5    STONEY
 BROAK BROWN"
 670 PRINT
 680 PRINT " YOU MAY PICK ANY HO
RSE.ENTER YOUR NAME FIRST IF YOU
 WANT 1 AND SECOND IF YOU WANT 2
 E.T.C.IF YOU DON'T WANT THEM AL
L THEN ENTER X's UNTIL YOU GET T
O THE SET OF BRACKETS YOU WANT."
 690 INPUT V$,W$,X$,Y$,Z$
 695 PRINT
 700 PRINT "DO YOU WANT TO RACE
THEM NOW ?"
 750 INPUT G$
 800 IF G$="Y" OR G$="y" OR G$="
yes" OR G$="YES" THEN GO TO 30
 810 STOP
```

Mastering Machine Code — part seven

We welcome back Toni Baker, author of 'Mastering Machine Code on your ZX81', who this issue completes the racing car game she started in the Aug/Sept edition.

Having spent virtually the whole of my article in the Aug/Sept issue of *ZX Computing* introducing this program. I will not waste words providing more introduction. The program is called Racetrack and I hope you enjoy it!

I have chosen to document this program as I go through it, in the format of a small description followed by the relevant code — I hope you can all follow this.

Throughout the article, label names have been printed as hyphens. However, their correct notation for the Spectrum should be with an underlined dash. An example of this can be seen a little further in the text under the heading 'STR 3' — the data labels 'C-CAR' and 'H-CAR' should have been presented as 'C__CAR' and 'H__CAR'. I hope this does not cause any problems.

RACETRACK — This data represents the shape of the racetrack. Each byte represents one step around the track. The first Hex digit is the position of the left-hand wall plus two, and the second Hex digit is the position of the right-hand wall less 12h. So, for instance, the byte '96' implies that the left wall is at position 9 − 2 = 7, and the right wall is at position 6 + 12 = 18h.

```
8000  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96
8010  96 96 96 96 85 85 74 63 52 41 30 30 30 30 30 30
8020  41 52 63 63 74 85 96 A7 B8 C9 DA EB FC FC FC FC
8030  FC EB DA C9 B8 B8 B8 B8 B8 B8 B8 B8 B7 B7 B6 C6
8040  C6 C6 B5 A4 93 82 71 60 60 60 60 60 60 61 62 63
8050  64 65 66 66 66 66 76 76 86 96 A6 B6 B6 B6 C7 C8
8060  C9 C9 B8 A7 96 85 74 63 52 41 52 63 74 63 52 41
8070  41 41 50 50 50 50 50 50 50 50 50 60 60 60 60 70
8080  70 70 81 92 A3 B4 C5 D6 E7 F8 F8 F8 F8 F8 F8 F8
8090  F8 E7 D6 C5 B4 A3 A3 A3 A3 A3 A3 A3 A2 A2 A2 A2
80A0  B2 B2 C2 C2 C2 C2 D2 D2 D2 D2 D2 D2 D2 D1 D1 D1
80B0  D1 D1 D1 D1 D1 D1 E1 E1 E1 E1 E1 E1 E0 E0 E0 E0
80C0  E0 E1 E2 E3 E4 E5 E6 E7 E8 E9 DA CB BC BD BC BB
80D0  BA B9 B9 B9 C9 C9 C9 C9 C9 C9 C9 C9 C9 C9 C9 B8
80E0  A7 B6 C5 D4 E5 F6 F6 E5 D4 C3 B2 A1 90 90 A1 B2
80F0  C2 C3 C4 B4 A5 A5 96 A5 A5 96 A5 96 96 96 96 96
```

STR — This is the initial state of the information window at the top of the screen. It represents PRINT PAPER 6,''Time Distance Distance to go (C) to go (H) '',,''= ='';PAPER 7;

```
8100  11 06 54 69 6D 65 20 20 20 20 44 49 73 74 61 6E
8110  63 65 20 20 20 20 44 69 73 74 61 6E 63 65 20 20
8120  20 20 20 20 20 20 20 20 20 20 74 6F 20 67 6F 20
8130  28 43 29 20 20 20 74 6F 20 67 6F 20 28 48 29 20
8140  20 20 06 06 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D
8150  3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D 3D
8160  3D 3D 3D 3D
```

STR 2 — This represents PRINT TAB 7;''graphic shift 8'';TAB 18;''graphic shift 8'';

```
8166  17 07 00 8F 17 18 00 8F
```

STR 3 — This represents PRINT AT 05,0A;INK 1;''car c'';INK 0;''   '';INK 2;''car h'';INK 0;. The data C-CAR (computer's car) and H-CAR (human's car) are obviously included within this string (at addresses 8171 and 8180 respectively).

```
816E  16 05 0A
8171  10 01 8E 8D 14 01 43 14 00 8E 8D 10 00
817E  20 20
8180  10 02 8E 8D 14 01 48 14 00 8E 8D 10 00
```

TIME, DIST C and DIST H — There are the strings AT 2,0;INK 0;PAPER 6;''0000'';, etc, which are printed in the information window during the game.

```
818D  16 02 00 10 00 11 06 30 30 30 30
8198  16 02 0A 10 00 11 06 32 30 30 30
81A3  16 02 16 10 00 11 06 32 30 30 30
```

The following are various calling points which PRINT AT various parts of the screen. The labels used are fairly self-explanatory.

```
81AE  3D      AT 5,A-3     DEC A
81AF  3D      AT 5,A-2     DEC A
      3D                   DEC A
81B1  1605    AT 5,A       LD D,05
      1802                 JR AT D,A
81B5  1615    AT 15,A      LD D,15
      5F      AT D,A       LD E,A
      1813                 JR AT D,E
```

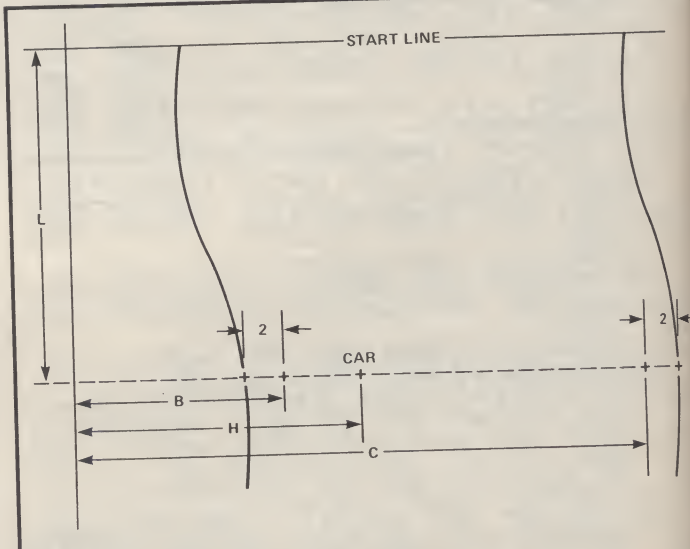


Fig. 1.

This subroutine will erase the previous image of a car from the screen (if one exists) and moves the print position one square down ready to re-print the car having moved forward, if necessary. It requires D,E be the PRINT AT co-ordinates of the existing position of the car.

```
81BA  CDCD81  ERASE-CAR  CALL AT D,E      Print at D,E if on screen.
      300D               JR NC,BANANA     Jump if not on screen.
      3E11               LD A,''paper''
      D7                 RST 10
      3E07               LD A,''white''
      D7                 RST 10           Print PAPER 7;
      0605               LD B,05
      3E20    APPLE      LD A,''space''
      D7                 RST 10           Overwrite with spaces.
      10FB               DJNZ APPLE
      14      BANANA     INC D            Move AT co-ordinates to
                                          next line.
              AT D,E     $                Move print position accor-
                                          dingly.
```

This subroutine moves the print position to AT co-ordinates D,E if this is on the screen. If this is not on the screen, the subroutine returns NO CARRY.

```
81CD  7A      AT D,E     LD A,D
      D604               SUB 04
      FE12               CP 12
      D0                 RET NC           Return if not on screen.
      3E16               LD A,''at''
      D7                 RST 10
      7A                 LD A,D
      D7                 RST 10
      7B                 LD A,E
      D7                 RST 10           Print AT D,E;
      37                 SCF              Indicate co-ordinates on
                                          screen.
      C9                 RET
```

This next subroutine is equivalent to PRINT AT 15h,A;''graphic shift 8'';.

```
81DC  CDB581  AT 15,A-G  CALL AT 15,A     Print AT 15h,A;
      3E10               LD A,''ink''
      D7                 RST 10
      3E00               LD A,''black''
      D7                 RST 10           Print INK 0;
      3E8F               LD A,''graphic
                         shift 8''
      D7                 RST 10           Print ''graphic shift 8'';
      C9                 RET
```

The next subroutine will print either the human car or the computer car, depending on which address it is called from.

```
81E9  118081  PR-HC      LD DE,H-CAR      Point to start of string.
      1803               JR CHERRY
81EE  117181  PR-CC      LD DE,C-CAR      Point to start of string.
      010D00             LD BC,000D       BC:=length of string.
      3E11               LD A,''paper''
      D7                 RST 10
      3E07               LD A,''white''
      D7                 RST 10           Print PAPER 7;
      C33C20             JP PR-STRING     Print the appropriate car.
```

The next subroutine decrements either the human's distance to go or the computer's distance to go. If this distance reaches zero, then the screen is inverted. The subroutine requires that HL points to the last byte of the string in question (ie 81A2 for the computer, or 81AD for the human).

```
81FD  E5       DEC-DIST    PUSH HL             Stack address of last byte.
      7E       PEAR        LD A,(HL)           A:=next digit
      FE30                 CP ''0''
      2005                 JR NZ,ORANGE        Jump unless digit equals zero.
      3639                 LD (HL),''9''       Change digit to nine
      2B                   DEC HL              and consider next digit left.
      18F6                 JR PEAR
      35       ORANGE      DEC (HL)            Decrement digit.
      E1                   POP HL              HL:=address of last byte.
      E5                   PUSH HL
      0604                 LD B,04
      3E30                 LD A,''0''
      BE       STRAWBERRY  CP (HL)             Check whether distance has
      2B                   DEC HL              reached 0000.
      2011                 JR NZ,PEACH         Jump if not.
      10FA                 DJNZ STRAWBERRY
      210040               LD HL,D FILE        Point to first byte of screen.
      7E       LEMON       LD A,(HL)
      EEFF                 XOR FF
      77                   LD (HL),A           Invert next byte.
      23                   INC HL              Point to next byte.
      7C                   LD A,H
      FE58                 CP 58               Continue until end of screen
      20F6                 JR NZ,LEMON         reached.
      CFFF                 RST 08/DEFB FF      Return to BASIC.
      E1       PEACH       POP HL              HL: Points to last byte.
      01F6FF               LD BC,FFF6
      09                   ADD HL,BC           HL: Points to first byte.
      010B00               LD BC,000B          BC:=length of string.
      EB                   EX DE,HL            DE:=address of string.
      C33C20               JP PR-STRING        Print the string.
```

This next subroutine finds the position of the racetrack walls at any point on the route. Referring to the diagram in Fig. 1, the subroutine finds B and C assuming that L is known.

```
8230  E5      EDGES      PUSH HL          Stack the initial value of H.
      2680               LD H,80          HL: points to byte in
                                          RACETRACK data.
      7E                 LD A,(HL)
      1F                 RRA
      1F                 RRA
      1F                 RRA
      1F                 RRA
      E60F               AND OF           Isolate first Hex digit.
      47                 LD B,A           Assign B as required.
      7E                 LD A,(HL)
      E60F               AND OF           Isolate second Hex digit.
      C610               ADD A, 10
      4F                 LD C,A           Assign C as required.
      E1                 POP HL           Restore H.
      C9                 RET
```

This next subroutine tests whether or not a car has crashed. It requires that D, E, H and L are assigned as in Fig. 2 (where car one is the car being tested, and car two is the other car). It returns ZERO if the car has crashed, or NON ZERO if the car has not crashed.

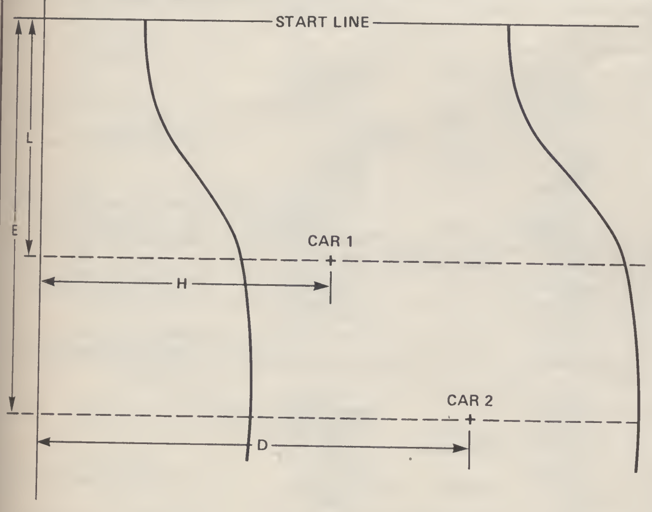


Fig.2.

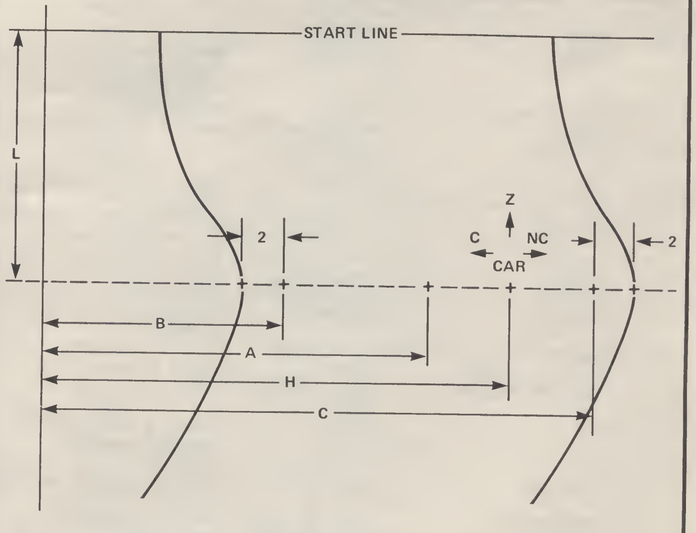


Fig.3.

```
8243   CD3082   CRASH-TEST  CALL EDGES     Assign B and C to indicate
                                           the position of the
                                           racetrack walls.
       7C                   LD A,H
       B8                   CP B           Test for collision with left-
       C8                   RET Z          hand wall.
       B9                   CP C           Test for collision with
       C8                   RET Z          right-hand wall.
       7D                   LD A,L
       BB                   CP E
       C0                   RET NZ         Exit unless level with other
                                           car.
       7C                   LD A,H
       92                   SUB D          A: = distance between cars.
       C604                 ADD A,04
       FE09                 CP 09          Are they in collision range?
       3802                 JR C,LIME      Jump if so.
       A7                   AND A          Reset zero flag
       C9                   RET            and exit.
       BF       LIME        CP A           Set zero flag
       C9                   RET            and exit.
```

This next subroutine checks whether or not the human car has crashed. If so, then the screen will flash and the game will be over.

```
825A   2AAE5C    H-CRASH-TESTLD HL,(HC)     HL: = position of human car.
       ED5BB05C              LD DE,(CC)     DE: = position of comp car.
       CD4382                CALL CRASH-
                             TEST           Test for crash.
       C0                    RET NZ         Return unless crashed.
       210058                LD HL,ATTRS    HL: points to attribute file.
       CBFE      MELON       SET 7,(HL)     Flash next square.
       23                    INC HL         Point to next attribute.
       7C                    LD A,H
       FE5B                  CP 5B          Repeat for whole of
       20F8                  JR NZ,MELON    attribute file.
       CFFF                  RST 08/DEFB FF
```

This subroutine checks whether or not the Space key is depressed at any instant. It returns NO CARRY if the Space key is pressed, and CARRY otherwise.

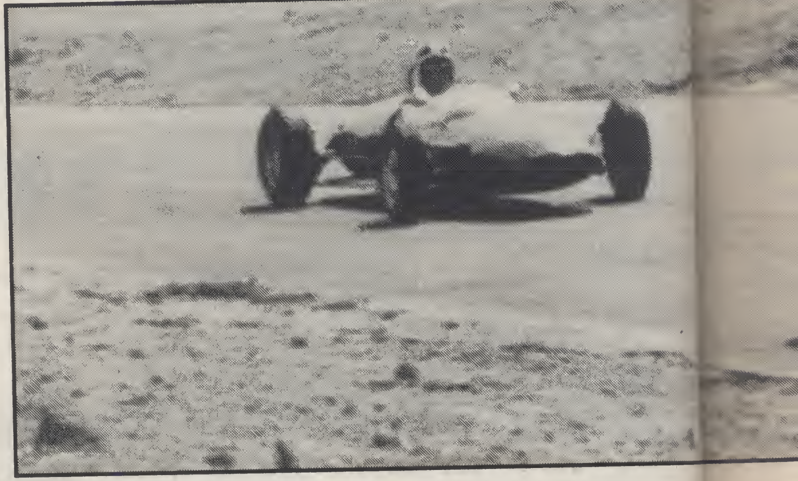
```
8272   3E7F      SPACE-KEY   LD A,7F
       DBFE                  IN A,(FE)      Scan segment 7 of the
                                            keyboard.
       1F                    RRA            Move SPACE bit into carry.
       C9                    RET
```

The purpose of this next subroutine is to print a space character (a white square).

```
8278   3E11      PR-SPACE    LD A,"paper"
       D7                    RST 10
       3E07                  LD A,"white"
       D7                    RST 10         Print PAPER 7;
       3E20                  LD A,"space"
       D7                    RST 10         Print "   ";
       C9                    RET
```

And now for the interesting parts. This subroutine moves the human car left or right as required.

```
8282   3EFE      HC-LR       LD A,FE
       DBFE                  IN A,(FE)      Scan segment 0 of the
                                            keyboard.
       1F                    RRA            Move Caps Shift bit
                                            into carry.
       3815                  JR C,GRAPE     Jump if Caps Shift pressed.
       CD7282                CALL SPACE-
                             KEY
       C0                    RET NC         Return unless Space
                                            pressed.
       3AAF5C                LD A,(HC-H)    A: = horizontal co-ordinate
                                            of centre of human car.
       CDAE81                CALL AT 5,A-3  Print AT 5,A-3;
       CDE981                CALL PR-HC     Print human car.
       CD7882                CALL PR-SPACE  Print space.
       FD3575                DEC (HC-H)     Change horizontal co-
                                            ordinate.
       18BC                  JR H-CRASH-
                             TEST           Check for crash.
       CD7282    GRAPE       CALL SPACE-
                             KEY
       C8                    RET C          Return if both Caps Shift
                                            and Space pressed
                                            together.
       3AAF5C                LD A,(HC-H)    A: = horizontal co-ordinates
                                            of car.
       CDAF81                CALL AT 5,A-2  Print AT 5,A-2;
       CD7882                CALL PR-SPACE  Print space.
       CDE981                CALL PR-HC     Print human car.
       FD3475                INC (HC-H)     Change horizontal co-
                                            ordinate.
```



```
       18A7                  JR H-CRASH-
                             TEST           Check for crash.
```

This subroutine assigns A, B and C as in Fig. 1. A returns the position of the exact centre of the racetrack at that point. The subroutine also returns ZERO if the car is already at the centre, CARRY if the car is to the right of the centre, and NO CARRY if the car is to the left of the centre. The subroutine requires H and L to be previously assigned.

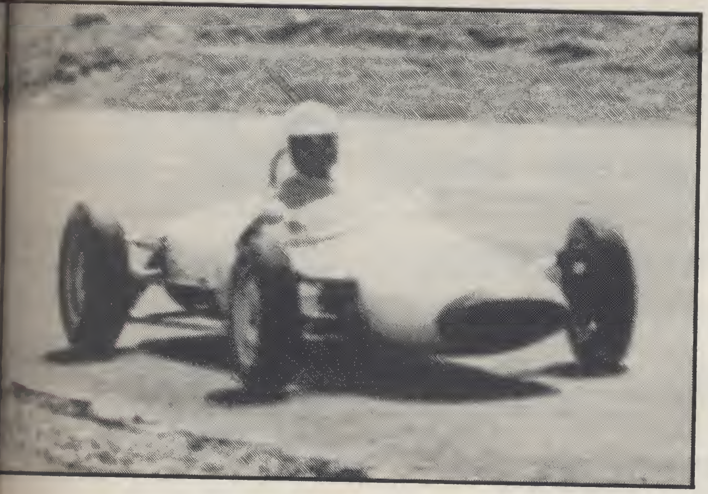
```
82B3   CD3082    CENTRE      CALL EDGES     Assign B and C as
                                            required.
       78                    LD A,B
       81                    ADD A,C
       CB3F                  SRL A          A: = (B + C)/2.
       BC                    CP H           Assign flags.
       C9                    RET
```

This next subroutine works out the print position of the computer's car. It assumes that at the start of the routine HL contains the co-ordinates of this car, and DE the co-ordinates of the human car. It will also store the car's co-ordinates.

```
82BC   22B05C    POSN        LD (CC),HL     Store co-ordinate.
       7D                    LD A,L         A: = vertical co-ordinate.
       93                    SUB E          A: = vertical distance
                                            between cars.
       C605                  ADD A,05       A: = Y co-ordinate of print
                                            position
       57                    LD D,A
       5C                    LD E,H         E: = position of centre of
                                            car.
       1D                    DEC E
       1D                    DEC E          E: = x co-ordinate of print
                                            position.
```

This next subroutine moves the computer car left or right as required. It identifies two different cases: (i) if the human car is in the vicinity, and (ii) if the human car is not in the vicinity. Each case uses its own algorithm.

```
82C8   2AB05C    CC-LR       LD HL,(CC)
       ED5BAE5C              LD DE,(HC)
       7B                    LD A,E         A: = vertical co-ordinate of
                                            human car.
       95                    SUB L          A: = distance between cars.
       3C                    INC A
       FE10                  CP 10
       3805                  JR C,PINEAPPLE Jump if human in vicinity.
       CDB382                CALL CENTRE    BC: = wall positions.
       1812                  JR GRAPEFRUIT  surrounding computer car.
       EB        PINEAPPLE   EX DE,HL
       CDB382                CALL CENTRE    BC: = wall position
       EB                    EX DE,HL       surrounding human car.
       7A                    LD A,D
       3805                  JR C,MANGO     Jump if human
                                            car is to the right
                                            of centre.
       81                    ADD A,C
       C604                  ADD A,04
       1803                  JR PLUM
       80        MANGO       ADD A,B
       D604                  SUB 04
       1F        PLUM        RRA            A: = centre of largest gap.
       BC                    CP H
       C8        GRAPEFRUIT  RET Z          Return if no movement
                                            required.
       3802                  JR C,          Jump if left movement
                               GOOSEBERRY   required.
```



```
        24                   INC H
        24                   INC H
        25     GOOSEBERRY    DEC H              H:= new co-ordinate of
                                                centre of car.
        08                   EX AF,AF'          Store flags.
        CD4382               CALL CRASH-        Test for crash.
                               TEST
        C8                   RET Z              Don't move if it would
                                                cause a crash.
        CDBC82               CALL POSN          Find print position of car.
        08                   EX AF,AF'          Restore flags.
        380B                 JR C,DAMSON        Jump if left movement
                                                required.
        1D                   DEC E
        CDCD81               CALL AT D,E        Print AT D,E; (if on
                                                screen).
        D0                   RET NC             Return if off screen.
        CD7882               CALL PR-           Print a space.
                               SPACE
        C3EE81               JP PR-CC           Print computer car and
                                                exit.
        CDCD81 DAMSON        CALL AT D,E        Print AT D,E; (if on
                                                screen).
        D0                   RET NC             Return if not on screen.
        CDEE81               CALL PR-CC         Print computer car.
        C37882               JP PR-SPACE        Print a space and exit.
```

This next subroutine moves the human car downwards.

```
8313    1605   HC-DOWN       LD D,05
        FD5E75               LD E,(HC-H)
        1D                   DEC E
        1D                   DEC E
        CDBA81               CALL ERASE-CAROverwrite old car.
        CDE981               CALL PR-HC         Print new car below it.
        FD3474               INC (HC-V)         Change vertical co-
                                                ordinate.
        CD5A82               CALL H-CRASH-      End game if crashed.
                               TEST
        21AD81               LD HL, DIST-H+
                               0A
        CDFD81               CALL DEC-DIST      Decrement distance to go.
        0613                 LD B,13
        CD0E00               CALL CL-SCROLL     Scroll lower part of screen.
        3AAE5C               LD A,(HC-V)
        C611                 ADD A,11
        6F                   LD L,A             L:= vertical co-ordinate of
                                                new line visible.
        CD3082               CALL EDGES         BC:= wall positions at this
                                                point.
        78                   LD A,B
        3D                   DEC A
        3D                   DEC A
        CDDC81               CALL AT 15,A-G     Print left wall.
        79                   LD A,C
        3C                   INC A
        3C                   INC A
        C3DC81               JP AT 15,A-G       Print right wall and exit.
```

And this subroutine moves the computer car downwards.

```
8346    2AB05C CC-DOWN       LD HL,(CC)
        2C                   INC L              L:= new vertical co-
                                                ordinate.
        ED5BAE5C             LD DE,(HC)
        CD4382               CALL CRASH-
                               TEST
        C0                   RET Z              Exit if this move would
                                                crash.
        CDBC82               CALL POSN          DE:= PRINT AT co-
                                                ordinates.
        15                   DEC D
        CDBA81               CALL ERASE-CAROverwrite previous car.
        DCEE81               CALL C,PR-CC       Print new car if on screen.
        21A281               LD HL,DIST-C+      Point to last byte of string.
                               0A
        C3FD81               JP DEC-DIST        Decrement distance to go
                                                and exit.
```

The overall computer's move is therefore produced by the following subroutine.

```
8362    CD4683 MOVE-CC       CALL CC-DOWN
        C3C882               JP CC-LR
```

The following routine tests whether or not the accelerator (Symbol Shift) key is pressed, and exits if it is not, after a short pause.

```
8368    CD7282 MOVE-HC-A     CALL SPACE-KEY A:= scan of keyboard
                                            segment 7.
        1F                   RRA            Move Symbol Shift bit into
                                            carry.
        3009                 JR NC, MOVE-HC Jump if Symbol Shift
                                            pressed.
        010008               LD BC,0800
        0B     DELAY         DEC BC
        78                   LD A,B
        B1                   OR B
        20FB                 JR NZ,DELAY
        C9                   RET
               MOVE-HC       $
```

And now the overall human's move can be produced, thus:

```
8377    CD1383 MOVE-HC       CALL HC-DOWN
        C38282               JP HC-LR
```

The whole program may now be written. This is the start of the program – USR should point to this address.

```
837D    213030 START         LD HL,3030         H:= L:= "0"
        229481               LD (TIME+07),HL
        229681               LD (TIME+09),HLTIME:= "0000"
        22A181               LD (DIST-C+09),
                               HL
        22AC81               LD (DIST-H+09),
                               HL
        213230               LD HL,3032         H:= "0", L:= "2".
        229F81               LD (DIST-C+07), DIST-C:= "2000"
                               HL
        22AA81               LD (DIST-H+07), DIST-H:= "2000"
                               HL
        210013               LD HL,1300
        22AE5C               LD (HC),HL         Assign initial human co-
                                                ordinates.
        260C                 LD H,0C
        22B05C               LD (CC),HL         Assign initial comp co-
                                                ordinates.
        AF                   XOR A
        323C5C               LD (TVFLAG),A      Print to upper part of
                                                screen.
        016600               LD BC,0066
        110081               LD DE,STR-1
        CD3C20               CALL PR-STRING Print information window.
        0612                 LD B,12
        C5     CHERRY        PUSH BC
        010800               LD BC,0008
        116681               LD DE,STR-2
        CD3C20               CALL PR-STRING Print walls.
        C1                   POP BC
        10F3                 DJNZ CHERRY
        011F00               LD BC,001F
        116E81               LD DE,STR-3
        CD3C20               CALL PR-STRING Print cars.
83C5    CD6283 MAIN-LOOP     CALL MOVE-CC
        CD7783               CALL MOVE-HC
        CD6283               CALL MOVE-CC
        CD6883               CALL MOVE-HC-A
        CD6283               CALL MOVE-CC
        CD7783               CALL MOVE-HC
        CD6883               CALL MOVE-HC-A
        219781               LD HL,TIME+0A  HL:= points to last byte of
                                            TIME.
        7E     TOMATO        LD A,(HL)      A:= next digit
        FE39                 CP "9"
        2005                 JR NZ,
                               RASPBERRY
        3630                 LD (HL),"0"
        2B                   DEC HL
        18F6                 JR TOMATO
        34     RASPBERRY     INC (HL)       Increase digit.
        118D81               LD DE,TIME
        010B00               LD BC,000B
        CD3C20               CALL PR-STRING Print TIME string.
        18D2                 JR MAIN-LOOP
```

'NOW WIN THE POOLS'

THIS IS MEANT FOR YOU — ESPECIALLY IF YOU USE SINCLAIR SPECTRUM COMPUTER, or even ANY COMPUTER — OR NO COMPUTER AT ALL

HAVE YOU EVER HAD THAT DREAM OR EVER WISHED THAT YOU HAD "WON ON THE POOLS" — AT LAST YOU CAN TURN IT INTO REALITY.

THERE **IS** A SECRET OF "HOW TO WIN ON THE FOOTBALL POOLS" — **IT CAN BE DONE.** I DISCOVERED THE SECRET A LONG TIME AGO — NOW, **FOR THE FIRST TIME** I'M PREPARED TO SHARE IT WITH YOU.

HOW DOES THIS INTEREST YOU — I HAVE DOCUMENTARY EVIDENCE BY WAY OF POOLS WINNINGS DIVIDEND SLIPS/ CANCELLED CHEQUES, etc, SHOWING MY PRESENT WINS ON THE POOLS AS FOLLOWS:—

First Dividends	Second Dividends	Third Dividends	Fourth Dividends	Fifth Dividends	Sixth Dividends
765	1,818	2,942	1,952	631	93

A GRAND TOTAL OF 8,201 (EIGHT THOUSAND, TWO HUNDRED AND ONE DIVIDENDS — so far).

I HOLD THE UNCHALLENGED WORLD'S RECORD FOR POOLS WINS

I AM MAKING THIS VERY SPECIAL, REDUCED PRICE OFFER TO READERS OF ZX COMPUTING FOR A LIMITED PERIOD ONLY.

Do not let anyone tell you that it is impossible to "WIN ON THE POOLS" — since I perfected my method, **I HAVE WON REGULARLY** for over **TWENTY-FIVE YEARS** — proof that it is no 'flash-in-the-pan'.

I have CHALLENGED THE WORLD with my record of wins and with all the evidence that I possess — NO ONE has ever been able to accept the Challenge — I KNOW NO ONE EVER WILL.

MY SECRET IS NOW PLACED ONTO COMPUTER CASSETTE FOR YOU.

THE METHOD IS THE GREATEST TREBLE CHANCE WINNER IN THE HISTORY OF FOOTBALL POOLS — IT WILL LAST FOREVER — BOTH FOR ENGLISH AND AUSTRALIAN FOOTBALL POOLS, WITH EQUAL SUCCESS.

I now intend to give a limited number of people the opportunity of making use of my method — perfected over 25 years and proving itself on **EVERY ONE OF THOSE TWENTY-FIVE YEARS.**

You will have noted details of my personal achievements so far, as given to you above.

A GRAND TOTAL of 8,201, yes 8,201 POOLS DIVIDENDS, including **765 FIRST DIVIDENDS.**

My Pools Winnings Dividend slips now number so many, that they fill a very large suitcase and will stand as my evidence of all claims in **ANY COURT OF LAW IN THE WHOLE WORLD.**

Taking just the past 25 years into consideration, I have won ON AVERAGE over 328, (THREE HUNDRED AND TWENTY—EIGHT) Pools Dividends **EVERY YEAR** — or — AN AVERAGE of over **SIX DIVIDENDS EVERY WEEK** for **TWENTY—FIVE YEARS.**

You have my absolute Guarantee of the complete authenticity of every claim, cheque, document, letter, etc, contained herein.

I do have losing weeks, but ON AVERAGE my winnings show over SIX DIVIDENDS **EVERY WEEK** for the past 25 years.

I know that you are now utterly flabbergasted, it always happens to everyone with whom I come into contact. Please just sit back and **imagine** for a moment my **FIRST DIVIDEND** wins alone — they now number 765 (seven hundred and sixty-five) and will probably be even more by the time this advertisement appears in print.

I AM NUMBER ONE IN THE WORLD AND NO ONE DISPUTES IT.

For as long as I continue to enter the Football Pools my wins will continue. I have already said, they apply, with equal success to both English and Australian Football Seasons.

I intend to release a STRICTLY LIMITED NUMBER of copies of my cassette, — DO NOT DELAY AND FIND YOU ARE TOO LATE, in which case I would have to refund your money.

I am so confident of **YOUR** success that if do **not** win at least THREE FIRST TREBLE CHANCE DIVIDENDS in the first 20 weeks of entering, I will completely cancel the balance of the purchase price and you do not have to pay me another penny, at any time, no matter how vast your winnings.

I only wish that space would allow me to give you photographs of my winnings slips, cancelled cheques, etc, but it is of course impossible — they now number 8,201 dividends. I have however given JUST A FEW EXTRACTS from ORIGINAL LETTERS I hold from my small Clientele.

I am the Inventor and Sole Proprietor of my method, Registered as EUREKA — ('I have found it'). I am known as The Professor in Pools Circles — I am of the Highest Rank in Forecasting — this is beyond dispute. I am marketing a limited number of Computer Cassettes, under my Registered Company — FOOTBALL ENTERPRISES.

My initial charge for a copy was £75, but for this SPECIAL REDUCED PRICE OFFER I will send you a copy, for £20, (twenty pounds) ONLY, plus your Promise to pay me the balance of £55 — ONLY IF YOU WIN AT LEAST THREE FIRST TREBLE CHANCE DIVIDENDS IN YOUR FIRST 20 WEEKS OF ENTERING — otherwise you owe me NOTHING FURTHER.

This is surely proof absolute of my supreme and utter confidence in my own abilities and in the capabilities of my discovery. I could easily CHARGE £2,000 per cassette on the evidence I possess, but that would not be fair to everyone, which is what I want to do.

My method is WORLD COPYWRIGHT, any infringement and immediate proceedings will be taken, without prior warning. It is truly ingenious and has stood the test of time.

My cassette is simplicity itself to operate and you'll be given FULL DETAILS for weekly calculating. Your entry need not involve you in any large weekly stakes, you can enter for as little as 25p, if you wish.

I charge NO COMMISSION on any of your wins — no matter how BIG they may be.

I realised a long time ago, that it was no good sitting down and **dreaming** about winning the pools, so I burnt the candle at both ends, working late into the night, occasionally RIGHT THROUGH THE NIGHT, I **KNEW** there was a way, eventually it all paid off and has been doing so ever since.

I am unable to vary my offer to anyone, so please do not request it, as I shall very easily dispose of the cassettes I have prepared and am making available.

IMMEDIATELY I perfected my method I commenced winning right away, (first with just a little £163, the first week I used it), I HAVE NEVER LOOKED BACK SINCE, amongst all those dividends was one for over **EIGHT THOUSAND POUNDS** for just **one eighth of a penny stake.**

I will release a copy on cassette, to you, on receipt of the completed order form and your Signature thereon, confirming you will treat it in the STRICTEST CONFIDENCE between us and retain it for your **OWN USE ONLY.**

PLEASE NOTE:
If you happen to be the proud owner of a Computer **other than** Sinclair Spectrum, you can still purchase a copy of my method, for the same price and program it YOURSELF on to YOUR OWN COMPUTER — or even if you do not have a computer.

Don't take my word for it, read what people write about me and my method:—

I won on Zetters last weekend. It was not a big sum, but all the same it was a very nice surprise for me. J.C., Lancs.

I appreciate the straightforward method you adopt, which is such a contrast to the rubbish of misrepresentation which is so common in the Betting World, by unscupulous and self-opinionated charlatans. C.H., Devon

Winnings cheque received today, sincere thanks. D.N., Devon

I congratulate you on your achievement. R.R., Wales

I should like to thank you for a most exciting season and look forward to hearing from you again. J.C., Hants.

I would like to acknowledge cheque and say how much I appreciate your integrity. J.M., Scotland

Many thanks for your system, it is all you say and more. J.C., Lancs.

Your wonderful system won me £3,527. I intend to visit London soon and will be able to come and see you personally. (Overseas Client). P.M., Kampala.

Many thanks for trying so hard to please us all, your brother should be thanked also. One of our daughters, WHOSE HUSBAND YOU HELPED ENORMOUSLY, has just phoned, the four of them have just spent a lovely holiday in Spain. K.R.,Isle of Man.

I sent in my FIRST entry last week and won 2nd and 3rd dividends, as you will see from the enclosed certificate. One more and I would have collected over £400 for FIRST dividend. Once I've won a fair amount I shall be staking from winnings and at 2p per line, A FIRST DIVIDEND last week at this would have been over £3,000. C.A., Yorks.

I am very interested indeed and enclose £20 herewith. I agree to pay you the balance of £55 **ONLY** if I win at least THREE FIRST TREBLE CHANCE DIVIDENDS in my first 20 weeks of entering — otherwise I owe you NOTHING FURTHER at any time — no matter how much money I win. My Signature below is my Undertaking to retain complete and absolute confidence about the method.

Name...

Address..

....

....

Signature XZ1

The Managing Director,
Football Enterprises,
'Anvon',
9 New Road,
Haverfordwest, Pembs.

Please tick if cassette is for:
Sinclair Spectrum (48K) ☐
Any other Computer ☐
No Computer at all ☐

Bookshelf

Looking for something to complement your bookshelves for Christmas? Patrick Cain takes a look at a selection of the latest titles....

The Sinclair Spectrum In Focus — Mark Harrison

The Sinclair Spectrum In Focus is probably the best of all the books I have looked at in this issue. Suitable for all Spectrum users, from beginners to those who already have some programming expertise and perhaps, too, programmers of other machines!

It is not a simple book and does not belittle difficult topics, but its achievements are worthy of a little study. Neither is it a book aimed at academics, for while Mark Harrison's handling of topics can be analytical and mathematical, he has taken care to assume little and explains new theory in a precise, logical and understanding fashion. On completion, the reader should have knowledge of the principles of a computer system, number systems used by computers, flow charts, Spectrum BASIC and logic, control statements and functions, an understanding of graphics and colour and their use in screen displays, to mention only a few. To add to this there is a list of good quality games and utility programs.

Well illustrated, legibly printed and well explained throughout its 180 pages, **The Sinclair Spectrum In Focus** is highly recommended.

Published by Sigma Technical Press, **The Sincliar Spectrum In Focus** is written by Mark Harrison and costs £6.25.
ISBN 0 905104 28 5

Dynamic Games For The ZX Spectrum — Tim Hartnell

Dynamic Games For The Spectrum by Tim Hartnell is typical of many books of this kind. Whether it will appeal to you depends on how many games you already have in your collection and your opinion of the twenty here. On comparison, they stand up well. Tim Hartnell is undoubtedly the foremost Sinclair author, and he has compiled a good variety of programs in this book. The games subdivide into four categories: arcade games, board games, adventure/simulation games and 'improve your mind' games — though I'm afraid none of them are very original.

Each program is supported by introductory text, which details the highlights and programming techniques employed. Learning this way can be both fun and profitable. There are some great games, but games such as 'Checkers', '3D Drive' and 'Death Race 2000' are more typical, although well suited in their degree of complexity to this type of learning. Books of this nature are useful programming aids, but at a price of £5.95 there may well be others that serve the same purpose more econimically.

Dynamic Games For The ZX Spectrum is compiled by Tim Hartnell and published by Interface.
ISBN 0 946195 137

the Sinclair Spectrum in focus
ZX Spectrum
The Virgin Computer Games Series
GAMES FOR YOUR ZX SPECTRUM
£££££'s of entertaining games for only £2.95

Games For Your ZX Spectrum — Peter Shaw

This is without doubt a full and lively book. Crammed into its 125 pages there is a section on how to write better programs, a bibliography, a glossary of computer associated terms and as the title suggests, and by far the biggest section, a collection of 23 good quality games.

As the author, Peter Shaw, points out, he has not included any simplistic space-wasting games. Those that he has included span a good range of game types — 'Ascot', 'Pontoon', 'Draughts', 'Dam Busters' and 'Hangman' are typical. Few of the games are too good to be improved upon and perhaps the scope that this leaves adds more to the book's value. All programs are written in BASIC, in a style which is simple to follow and will by example teach good technique. Equally easy to follow are the listings which, while being dumped to print to ensure correctness, are clearly printed.

Unfortunately, the other sections are of little value and serve only as padding to what is a good collection of software.

Games For Your Spectrum is written by Peter Shaw, published by Virgin and is excellent value at £2.95.
ISBN 0 907080 847

20 Simple Electronic Projects for the ZX81 and Spectrum — Stephen Adams

Computers can, as science fiction and advertising suggest, be used, when interfaced correctly, to control ▶

an endless variety of physical devices. All too often their full potential is not realised. Ignorance or myths about the complexities of such implementations prevent most capable users from venturing into this area of application. **20 Simple Electronic Projects For The ZX81 and Spectrum** by Stephen Adams should put an end to any apprehension. The contents of the 100 or so pages instruct on the construction of a burglar alarm, a light pen and an analogue digital converter and a further 17 projects; the theory and techniques learned will provide for countless more.

Each topic is accompanied by full descriptive text, clear and logical illustrations and background notes where necessary. Stephen Adams' treatment of the subjects should make them both comprehensible and appealing to anyone who has sat through a couple of years of school physics.

Now in its second edition **20 Simple Electronic Projects for the ZX81 and Spectrum** was a success the first time around and it may well be for you. Published by Interface Publications.

Delving Deeper into your ZX Spectrum — Dilwyn Jones

Beyond Simple BASIC Delving Deeper into your ZX Spectrum is the full title of this new book by Dilwyn Jones. Dilywn Jones is one of the notables of the Spectrum world, author of several books and regular contributor to the computer press, and well qualified to write such a book. Aimed at users who have mastered simple BASIC and who wish to further develop their own programming, this book is crammed with useful tips and techniques that will enhance each program.

In just over 200 pages, the author has compiled a battery Spectrum do's and don'ts, can's and can'ts that will bring realism and professionalism to programs. From understanding the system's memory or screen output to screen tricks; each section is described and explained in a clear and friendly way. On completion, your own skills should have developed sufficiently to write your own arcade software. Just in case it hasn't, six programs are included to show how it ought to be done.

Published by Interface, as part of the series 'Success in the Fast Lane', **Delving Deeper into your ZX Spectrum** is a worthwhile addition to Dilwyn Jones' titles.

ISBN 0 907563 24 4

Spectacular Games For Your ZX Spectrum — Hal Renko/Sam Edwards

Any book with a title like **Spectacular Games For Your ZX Spectrum** will always stir me to search and deny any claim. With this one, it wasn't too difficult — few of the games included in the 130 odd pages came close to being spectacular.

Each game was accompanied by some narrative; but this merely attempted to briefly describe the game and was of no instructive value. The illustrations were simple and, while often funny, their relevance is in question. Of the games, 'Kentucky Derby', 'Las Vegas A Go Go', 'Treasure Hunt' are all treading a well worn path. Perhaps it is because the authors, Hal Renko and Sam Edwards, wrote the book in Finland, and away from the UK software market that many of the other programs, while simple and uninvolved, are novel and good fun to play. Not the first book I would rush out to buy, but certainly one I'm glad to have in my collection.

Spectacular Games For Your ZX Spectrum is published by the Addison Wesley Publishing Co, written by Hal Renko and Sam Edwards and costs £3.95.

ISBN 0 201 14667 3

Creating Arcade Games On Your ZX Spectrum — Daniel Haywood

Creating Arcade Games On Your ZX Spectrum by Daniel Haywood is aimed at Spectrum users with a confident knowledge BASIC and perhaps an inkling of machine code. Its purpose, as the title declared, is to show how games of arcade standard are created. As such, it is nothing new; but credit should be given to its patient approach and the way it develops its topics by theory and example.

SPECTACULAR GAMES FOR YOUR ZX SPECTRUM
HAL RENKO/SAM EDWARDS
Beyond simple BASIC
DELVING DEEPER into your ZX SPECTRUM
Dilwyn Jones

Many books of this type go further — few of the games here, e.g. 'Squash' or 'Slalom', are possible rivals for 'Pacman'. However, as an instruction book it does its job well and the author shows real understanding of readers' possible problems when introducing new techniques like PEEK, POKE and Scrolling. Sadly, many of the listings are difficult to read and maybe more thought could have been given to dividing the book into logical chapters and indexing.

Written by Daniel Haywood, **Creating Arcade Games On Your ZX Spectrum** is published by Interface, runs to 160 pages and all the programs contained will run in 16K.
ISBN 0 907563 287

First Steps With Your Spectrum — Carolyn Hughes

First Step With Your Spectrum by Carolyn Hughes is a 125 page reader aimed at getting new Spectrum users, particularly the young, through those first few difficult hours when everything is so tremendously complicated, to an understanding of programming technique and a familiarity with the computer. The book achieves its aims by being aware of the readers' problems,assuming nothing and most importantly being fun.

From a brief chat on what computers do, the text continues to make sure that everything goes in the right place when the unit is assembled, to vivid descriptions of the use of Spectrum BASIC, to finally some simple but worthwhile games. Each topic is clearly and cleverly illustrated using wherever possible pictures instead of words, the effect being to make each point enjoyable and more memorable.

Suitable for kids of any age, **First Steps With Your Spectrum** is written by Carolyn Hughes, published by Armada and costs £1.25.
ISBN 0 00 692240 6

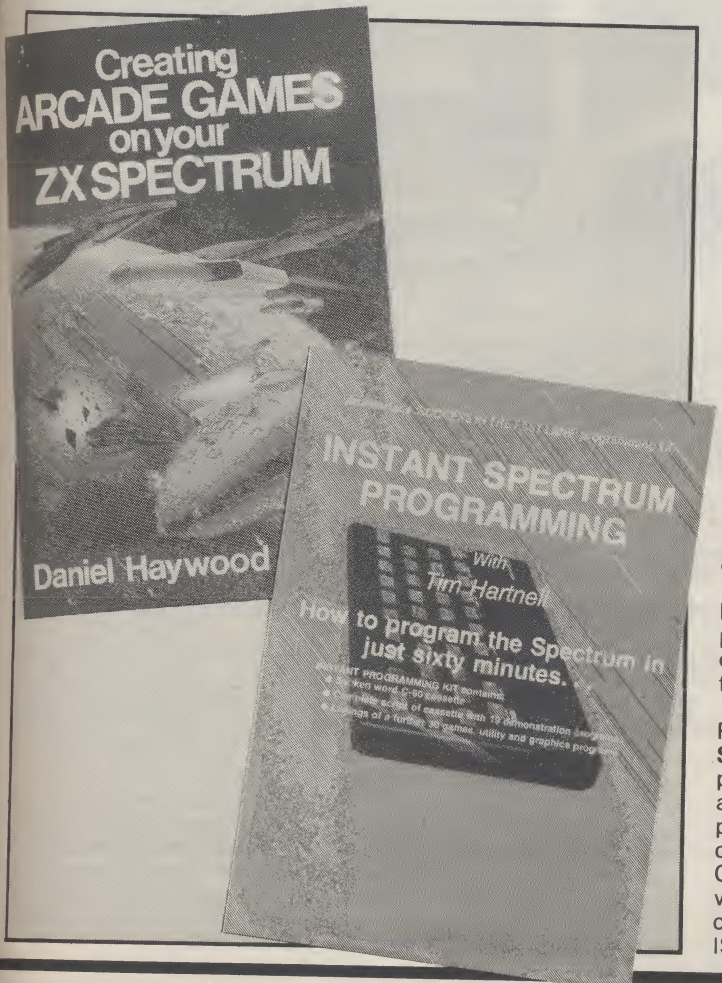
YOUNG PROGRAMMERS — START HERE!
FIRST STEPS WITH YOUR SPECTRUM
CAROLYN HUGHES
AN ARMADA ORIGINAL
Armada

Instant Spectrum Programming — Tim Hartnell

There can be no such things as 'instant programming'. But if there was, there would be no better person to prepare such a package than Tim Hartnell. Another of many books on Sinclair machines, Mr. Hartnell has put together a kit consisting of a one hour cassette tape and accompanying book, that will go a long way to help user gain elementary programming skills. And after that a selection of 30 games, utilty and graphics programs.

The tape is novel, but effective. It is clearly defined and well produced, and introduces the listener to each of the machine's keys, their functions, and with short programs highlights how they can be implemented. The dialogue and listings of those programs are included in the reader. The combination of both results in an effective and quick programming aid. It is regrettable that the program listing, dumped from ZX printer to ensure accuracy, are often indistinct and detract from a good overall idea.

Published by Interface, **Instant Spectrum Programming** is 124 pages of reasonable games and detailed elementary programming steps complimented by an excellent C60 instruction tape. It is written by Tim Hartnell and costs £4.95.
ISBN 0 907563 22 8


Creating ARCADE GAMES on your ZX SPECTRUM
Daniel Haywood
INSTANT SPECTRUM PROGRAMMING
With Tim Hartnell
How to program the Spectrum in just sixty minutes.

Easy Add On Projects for Spectrum, ZX81 & Ace — Owen Bishop

Easy Add-On Projects for Spectrum, ZX81 & Ace by Owen Bishop is one of those little pocket size books by Babani Publishing that I have often raved about in this column.

Like the rest, this one is packed from cover to cover with really useful information, presented in a fashion that is enjoyable to read and not too demanding. The aim of the book is to extend your micro — Spectrum, ZX81 & Ace, each is catered for equally well — beyond the level of running games programs to a small real time computer unit with practical applications. Each project covers the building of peripheral apparatus, interfacing, application programs — each is well explained and all the projects, 'Lightpen' to 'Rain Detector', should be within the grasp of anyone who has mastered BASIC programming.

Easy Add-On Projects for Spectrum, ZX81 and Ace is a 180 page reader of computer applications. It is published by Bernard Bambani and costs £2.75.
ISBN 85934 099 6

Five card trick

This program is a version of the card game, pontoon, for you to type in on your ZX81.

Including all the main features of pontoon, the program starts you off with £50 to gamble and the game will continue until you run out of cash.

Play your cards right in this ZX81 game written for us by Kenneth Law of Dunbartonshire.

Twisting the night away

As in the card game, you will be dealt a single card on which you must decide how much you would like to place a bet. Your second card will then be dealt to you. Should you be dealt two aces, the program automatically assumes the first ace is worth one and asks you whether you would like the second ace to be worth one or 11.

With two cards in your hand, you must decide whether you want to 'stick' with your hand or 'twist'. If you 'stick', it means you are happy with your hand as it stands and do not require another card. Should you not have enough points in your hand, you can 'twist', which means you are dealt another card which will get you nearer the magic number of 21. Should your cards total more than 21, the compuer will tell you that you have 'busted'.

Once you have stuck with your hand, the computer will work out its own hand and you will be told whether you have won or not. In the event of you and the computer both having hands which total the same, the computer will win — it's known in the 'trade' as 'banker's advantage'.

When you decide you have had enough of beating the computer at its own game, or you've been absolutely thrashed and you've lost all your money, you will be told your ranking as a pontoon player.

```
   1 REM         PONTOONS
BY   KENNETH M. LAW,ALEXANDRIA
   2 RAND
   3 GOSUB 8000
   4 LET M=50
   5 CLS
   6 LET Y$="10"
   7 LET A$="N"
   8 LET O$="N"
   9 LET Z$="N"
  10 LET A=0
  20 LET B=0
  30 LET C=-4
  40 LET E=0
  50 LET F=0
  60 LET G=0
  70 LET R=0
  75 LET U=0
  80 LET S=-4
  85 LET V=0
  87 LET XL=0
  88 LET XB=0
  90 GOTO 170
 100 FOR T=1 TO 3
 110 PRINT AT 20,0;"DO YOU WISH
A TWIST ? (Y OR N)"
 120 LET B$=INKEY$
 130 IF B$="Y" THEN GOTO 350
 140 IF B$="N" THEN GOTO 420
 150 GOTO 120
 160 NEXT T
 170 PRINT "PONTOONS","YOU HAVE
£";M
 180 PRINT AT 3,0;"BANKER""S CAR
DS"
 190 FOR N=1 TO 2
 200 PRINT "█████ █████ █████ █
██ █████"
 210 PRINT "█▚▚▚█ █▚▚▚█ █▚▚▚█ █▘
▗█ █▚▚▚█"
 220 PRINT "█▘?▗█ █▘?▗█ █▘?▗█ █▘
?▗█ █▘?▗█"
 230 PRINT "█▚▚▚█ █▚▚▚█ █▚▚▚█ █▘
▗█ █▚▚▚█"
 240 PRINT "█████ █████ █████ █
██ █████"
 250 PRINT AT 13,0;"YOUR CARDS"
 260 NEXT N
 270 FOR W=1 TO 2
 275 LET P=1
 280 LET B=INT (RND*13)+1
 282 IF B=1 THEN GOTO 1000
 284 IF B>=10 THEN GOTO 1500
 290 LET A=A+B
 295 LET U=U+B
 300 LET C=C+6
 310 PRINT AT 16,C;B
 315 IF C=2 THEN GOTO 900
 320 NEXT W
 330 IF A=21 OR U=21 THEN LET A$
="O"
 340 IF A<=21 OR U<=21 THEN GOTO
100
 350 FOR K=1 TO 3
 351 LET P=2
 353 RAND
 357 LET B=INT (RND*13)+1
 358 IF B=1 THEN GOTO 1000
 359 IF B>=10 THEN GOTO 1500
 360 LET A=A+B
 365 LET U=U+B
 370 LET C=C+6
 380 PRINT AT 16,C;B
 390 IF C=26 THEN LET G=5
 400 IF A>21 AND O$<>"Y" THEN GO
TO 800
 403 IF A>21 AND U>21 AND O$="Y"
THEN GOTO 800
 405 IF C=26 THEN GOTO 420
 410 IF A<=21 OR U<=21 THEN GOTO
160
 415 NEXT K
 420 FOR Z=1 TO 2
 423 LET QQ=1
 425 PRINT AT 20,0;"
                               "
 427 RAND
 430 LET D=INT (RND*13)+1
 433 IF D=1 THEN GOTO 3000
 436 IF D>=10 THEN GOTO 3500
 440 LET R=R+D
 445 LET V=V+D
 450 LET S=S+6
 460 PRINT AT 6,S;D
 470 NEXT Z
 480 IF R=21 OR V=21 THEN GOTO 6
80
 490 IF A$="O" THEN GOTO 700
 500 IF R>21 AND Z$<>"Y" THEN GO
TO 820
 503 IF R>21 AND V>21 AND Z$="Y"
THEN GOTO 820
 510 IF R>=16 AND R<=21 THEN GOT
O 620
 515 IF V>=16 AND V<=21 THEN GOT
O 620
 520 FOR Q=1 TO 3
 523 LET QQ=2
 525 RAND
 530 LET D=INT (RND*13)+1
 533 IF D=1 THEN GOTO 3000
 536 IF D>=10 THEN GOTO 3500
 540 LET R=R+D
 545 LET V=V+D
 550 LET S=S+6
 560 PRINT AT 6,S;D
 570 IF S=26 THEN LET E=5
 575 GOTO 581
 580 IF R>21 AND Z$<>"Y" THEN GO
TO 820
 581 IF R>21 AND V>21 AND Z$="Y"
THEN GOTO 820
 583 IF R>21 THEN LET R=V
 584 IF V>21 THEN LET V=R
 585 IF S=26 THEN GOTO 620
 586 IF U<=21 AND U>A THEN LET A
=U
 587 IF A>21 THEN LET A=U
 589 LET H=INT (RND*2)
 590 IF H=1 AND R>=16 AND R<=21
THEN GOTO 620
 595 IF H=1 AND V>=16 AND V<=21
THEN GOTO 620
 596 IF R<16 AND V<16 THEN GOTO
610
 597 IF H=2 AND R<20 AND V<20 TH
EN GOTO 610
 600 GOTO 620
 610 NEXT Q
 620 IF U<=21 AND U>A THEN LET A
=U
```

▶

```
 622 IF A>21 THEN LET A=U
 626 IF V<=21 AND V>R THEN LET R
=V
 628 IF R>21 THEN LET R=V
 630 IF E=5 AND G<>5 THEN GOTO 7
20
 635 IF G=5 AND E<>5 THEN GOTO 7
40
 640 IF E=5 AND G=5 AND R>=A THE
N GOTO 720
 650 IF E=5 AND G=5 AND A>R THEN
 GOTO 740
 660 IF R>=A THEN GOTO 760
 670 IF A>R THEN GOTO 780
 680 PRINT AT 10,0;"PONTOONS.BAN
KER WINS."
 685 LET M=M-X
 690 GOTO 840
 700 PRINT AT 10,0;"PONTOONS.YOU
 WIN."
 705 LET M=M+X
 710 GOTO 840
 720 PRINT AT 10,0;"BANKER WINS
WITH                A FIVE CARD
TRICK OF ";R;"."
 725 LET M=M-X
 730 GOTO 840
 740 PRINT AT 10,0;"YOU WIN WITH
                    A FIVE CARD
TRICK OF ";A;"."
 745 LET M=M+X
 750 GOTO 840
 760 PRINT AT 10,0;"BANKER WINS
WITH ";R;"."
 765 LET M=M-X
 770 GOTO 840
 780 PRINT AT 10,0;"YOU WIN WITH
";A;"."
 785 LET M=M+X
 790 GOTO 840
 800 PRINT AT 10,0;"BURST.BANKER
 WINS."
 805 LET M=M-X
 810 GOTO 840
 820 PRINT AT 10,0;"BURST.YOU WI
N."
 825 LET M=M+X
 840 PRINT AT 20,0;"DO YOU WISH
ANOTHER GAME?(Y/N)"
 850 LET B$=INKEY$
 860 IF B$="Y" THEN GOTO 5
 870 IF B$="N" THEN GOTO 9000
 880 GOTO 850
 900 PRINT AT 20,0;"HOW MUCH DO
YOU WANT TO GAMBLE ?"
 910 IF M<=0 THEN PRINT AT 20,0;
"YOU HAVE NO MORE MONEY TO GAMBL
E WITH."
 915 IF M<=0 THEN PAUSE 50
 920 IF M<=0 THEN GOTO 9000
 930 INPUT X
 940 IF X>M OR X<=0 THEN GOTO 93
0
 950 PRINT AT 1,16;"THIS GAME IS
"
 960 PRINT AT 2,18;"FOR £";X
 970 GOTO 320
1000 IF XL=1 THEN GOTO 2000
1010 LET XL=1
1020 LET O$="Y"
1030 LET A=A+B
1040 IF B=1 THEN LET U=U+11
1050 IF B=11 THEN LET U=U+1
1060 LET C=C+6
1070 PRINT AT 16,C;"A"
1080 IF P=1 THEN GOTO 315
1090 IF P=2 THEN GOTO 390
1500 LET A=A+10
1510 LET U=U+10
1520 LET C=C+6
1530 LET Y=INT (RND*4)+1
1540 IF Y=1 THEN LET Y$="10"
1550 IF Y=2 THEN LET Y$="J"
1560 IF Y=3 THEN LET Y$="Q"
1570 IF Y=4 THEN LET Y$="K"
1580 PRINT AT 16,C;Y$
1590 IF P=1 THEN GOTO 315
1600 IF P=2 THEN GOTO 390
2000 LET A=A+1
2010 LET U=U+1
2020 LET C=C+6
2030 PRINT AT 16,C;"A"
2040 IF P=1 THEN GOTO 315
2050 IF P=2 THEN GOTO 390
3000 IF XB=1 THEN GOTO 4000
3010 LET XB=1
3020 LET Z$="Y"
3030 LET R=R+D
3040 IF D=1 THEN LET V=V+11
3050 IF D=11 THEN LET V=V+1
3060 LET S=S+6
3070 PRINT AT 6,S;"A"
3080 IF QQ=1 THEN GOTO 470
3090 IF QQ=2 THEN GOTO 570
3500 LET R=R+10
3510 LET V=V+10
3520 LET S=S+6
3530 LET Y=INT (RND*4)+1
3540 IF Y=1 THEN LET Y$="10"
3550 IF Y=2 THEN LET Y$="J"
3560 IF Y=3 THEN LET Y$="Q"
3570 IF Y=4 THEN LET Y$="K"
3580 PRINT AT 6,S;Y$
3590 IF QQ=1 THEN GOTO 470
3600 IF QQ=2 THEN GOTO 570
4000 LET R=R+1
4010 LET V=V+1
4020 LET S=S+6
4030 PRINT AT 6,S;"A"
4040 IF QQ=1 THEN GOTO 470
4050 IF QQ=2 THEN GOTO 570
8000 FOR J=1 TO 50
8010 PRINT AT 10,10;"PONTOONS"
8020 PRINT AT 12,6;"BY KENNETH L
AW"
8030 PRINT AT 16,0;"YOU HAVE BEE
N GIVEN £50 TO      GAMBLE WITH,
COURTESY OF KENNETH LAW."
8050 PRINT AT 10,10;"PONTOONS"
8060 PRINT AT 12,6;"BY KENNETH L
AW"
8100 NEXT J
8200 CLS
8300 RETURN
9000 CLS
9010 PRINT AT 5,0;"YOU CAME OUT
OF THE CASINO WITH £";M
9020 IF M>50 THEN PRINT ,,,,"YOU
 MADE A PROFIT OF £";(M-50)
9030 IF M=50 THEN PRINT ,,,,"YOU
 DID NOT LOOSE ANYTHING."
9040 IF M<50 THEN PRINT ,,,,"YOU
 LOST £";(50-M)
9050 PRINT ,,,,"***************
************ PONTOON""S
*******************
 RATING ***************
**********"
9060 IF M>500 THEN PRINT ,,,,"YO
U ARE AN EXPERT,A PROFESSIONAL A
T WORK."
 3065 IF M>500 THEN GOTO 9200
9070 IF M>150 THEN PRINT ,,,,"YO
U ARE A GOOD CONSISTANCY      PL
AYER WITH WORKING GREY MATTER."
9075 IF M>150 THEN GOTO 9200
9080 IF M>50 THEN PRINT ,,,,"NOT
 BAD,AT LEAST YOU MANAGED TO BRE
AK EVENS."
9085 IF M>50 THEN GOTO 9200
9090 IF M=50 THEN PRINT ,,,,"YOU
 ARE NOT A GAMBLER,YOU ARE A MIS
ER."
3095 IF M=50 THEN GOTO 9200
9100 IF M<50 THEN PRINT ,,,,"ABS
OLUTELY PATHETIC-THAT""S YOU, MA
TE-MAY I SUGGEST A NEW HAT    MA
YBE ONE WHICH HAS A BIG ■ ON   IT
."
9200 STOP
```

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Skittles

A game of skill and judgement from Andrew Cook of Wigan.

This game for the Spectrum was written for my younger daughters who have difficulty manipulating four or five keys at once — which in most games I have come across is usually an absolute minimum.

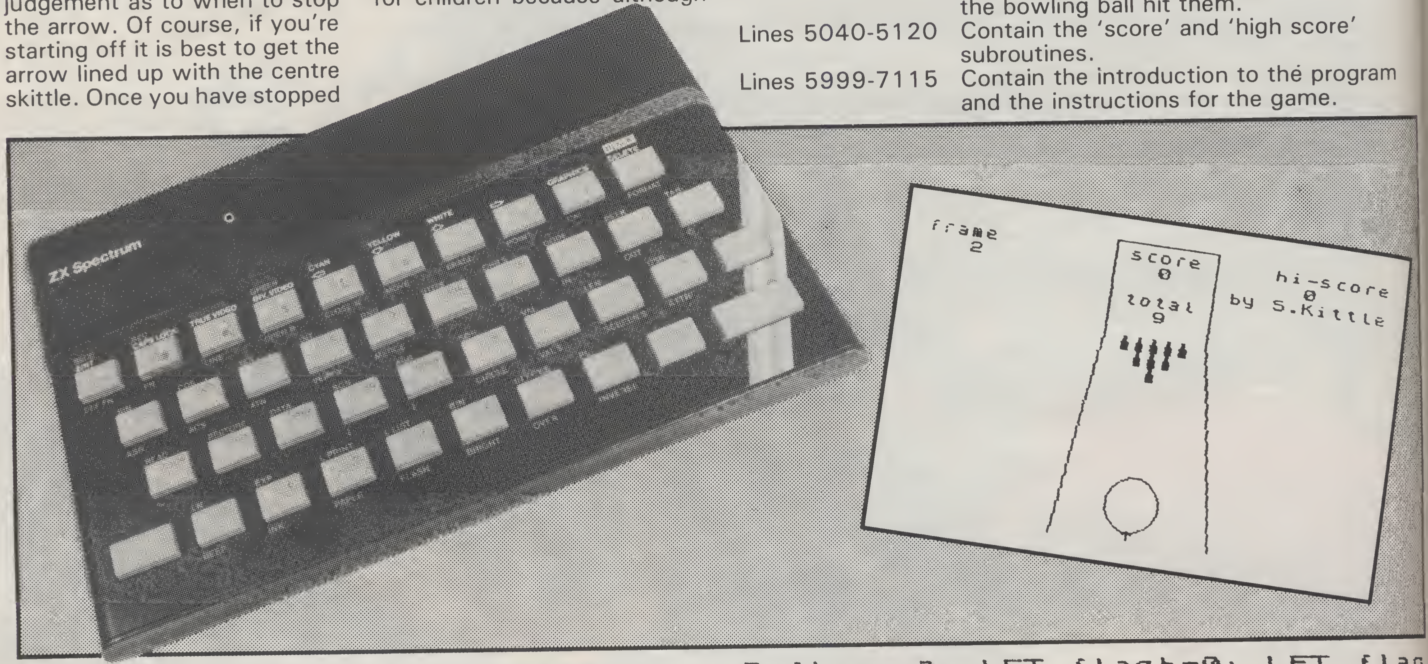
When the game is first RUN, a bowling alley is printed up on the screen with skittles shown at the far end. An arrow traverses at the start of the alley and you have to use your judgement as to when to stop the arrow. Of course, if you're starting off it is best to get the arrow lined up with the centre skittle. Once you have stopped the arrow, using the 'Z' key, you see the bowling ball roll down the alley knocking down all or a few of the skittles. Should you not have knocked down all the skittles, you will get a second attempt to knock down the remaining skittles. Once you have done this, you will be presented with the second frame; there are 10 frames in all.

The game is very suitable for children because although it is easy to play, it does require a fair amount of co-ordination to stop the arrow in the best place to hit the skittles.

Line by line

To help you get the most of the program, here follows a brief breakdown of the listing:

Lines 7-13	Select the level of difficulty of the game, ie how fast the arrow moves across the start of the bowling alley. There are three levels the first being the easiest. The speed of the moving arrow is determined by the length of the BEEP in line 200.
Lines 14-70	Print the bowling alley.
Lines 540-600	Print the skittles at the end of the bowling alley.
Lines 620-800	Contain the 'ball drawing' subroutine. This is achieved by successively drawing circles of diminishing radii on the same centre. The centre of the circle, a, is determined by where the moving arrow stops.
Lines 920-1020	Set the user-defined graphics.
Lines 2000-2050	Contain the loop used to move the arrow to aim the bowling ball.
Lines 4000-4055	These lines print the various combinations of skittles lying down, depending on where the bowling ball hit them.
Lines 5040-5120	Contain the 'score' and 'high score' subroutines.
Lines 5999-7115	Contain the introduction to thé program and the instructions for the game.



```
   1 REM **** SKITTLES ****
   2 REM ***** A.COOK   ****
   3 BORDER 5: PAPER 7: INK 2: L
ET intro=6000
   4 GO SUB intro
   5 CLEAR : RESTORE
   6 LET hi=0: LET a$="S.Kittle
"
   7 PRINT AT 10,5;"Enter level
of difficulty";AT 12,5;"1 Easy";
AT 13,5;"2 Harder";AT 14,5;"3 di
fficult"
  10 LET d$=INKEY$: IF CODE d$<4
9 OR CODE d$>51 THEN GO TO 7
  11 IF d$="1" THEN LET beep=.02
5
  12 IF d$="2" THEN LET beep=.01
25
  13 IF d$="3" THEN LET beep=.00
25
  14 CLS : PLOT 33,0: DRAW 15,11
2
  15 PLOT 176,0: DRAW -16,112
  16 PLOT 104,112: DRAW 0,50
  20 PLOT 160,112: DRAW 0,50: DR
AW -56,0
  29 LET total=0: LET count=1
  30 LET flag=0: LET score=0: LE
T flaga=0: LET flagb=0: LET flag
c=0: LET flagd=0
  31 LET a=0: LET chr=920: LET a
im=2000: LET path=3000: LET hit=
4000: LET counter=5000
  35 PRINT AT 2,14; INK 3;"score
";AT 3,16;score
  37 PRINT AT 5,14; INK 3;"total
";AT 6,16;total
  38 PRINT AT 2,0; INK 3;"frame
"
  40 PRINT AT 3,3; INK 3;count
  50 PRINT AT 2,24; INK 3;"hi-sc
ore "
  60 PRINT AT 3,26; INK 3;hi
  70 PRINT AT 4,21; INK 2;"by ";
a$
 500 RESTORE
 520 GO SUB chr
 540 FOR b=14 TO 18
 560 PRINT INK 0;AT 8,b;"A": NEX
T b
 580 FOR b=15 TO 17: PRINT INK 0
;AT 9,b;"A": NEXT b
 600 PRINT INK 0;AT 10,16;"A"
 610 IF flag=2 THEN GO TO counte
r
 615 GO SUB aim
```

```
620 CIRCLE INK 1;a,20,15
640 CIRCLE OVER 1;a,20,15
660 CIRCLE INK 1;a,40,12
680 CIRCLE OVER 1;a,40,12
700 CIRCLE INK 1;a,60,9
720 CIRCLE OVER 1;a,60,9
740 CIRCLE INK 1;a,80,6
760 CIRCLE OVER 1;a,80,6
780 CIRCLE INK 1;a,100,3
800 CIRCLE OVER 1;a,100,3
850 GO SUB hit
855 IF score=9 AND flag=1 THEN
PRINT FLASH 1;AT 3,16;"9": BEEP
.2,5: BEEP 1,3: GO TO counter
857 IF a=131 AND flag=2 THEN BE
EP .5,5: GO TO counter
860 PRINT AT 3,16; INK 3;score
870 PRINT AT 6,16; INK 3;total
880 PAUSE 100
910 IF a=131 THEN GO TO 30
915 GO TO 610
918 STOP
919 REM *****chr*****
920 FOR s=0 TO 7: READ x: POKE
USR "a"+s,x: NEXT s: REM graphic
A
940 FOR s=0 TO 7: READ x: POKE
USR "b"+s,x: NEXT s: REM graphic
B
960 FOR s=0 TO 7: READ x: POKE
USR "c"+s,x: NEXT s: REM graphic
C
980 DATA 24,24,24,60,60,60,60,6
0
1000 DATA 0,0,0,0,31,255,255,31
1020 DATA 0,0,0,0,248,255,255,24
8
1040 RETURN
1060 STOP
1999 REM **** aim ****
2000 FOR x=14 TO 18: PRINT AT 21
,x; INK 0;" ↑": BEEP beep,0: IF
INKEY$="z" THEN GO TO 2050
2005 NEXT x
2010 FOR x=18 TO 14 STEP -1: PRI
NT AT 21,x; INK 0;"↑ ": IF INKEY
$="z" THEN GO TO 2050
2015 NEXT x
2020 GO TO aim
2050 FOR p=13 TO 19: IF SCREEN$
(21,p)="↑" THEN GO SUB path
2055 NEXT p
2060 RETURN
2999 REM *****path*******
3000 IF p=13 THEN LET a=114
3005 IF p=14 THEN LET a=114
3010 IF p=15 THEN LET a=124
3020 IF p=16 THEN LET a=131
3030 IF p=17 THEN LET a=139
3040 IF p=18 THEN LET a=147
3045 IF p=19 THEN LET a=147
3050 RETURN
3999 REM *****hit******
4000 IF a=114 THEN PRINT INK 0;A
T 8,14;"B";AT 8,15;"B": IF flaga
=0 AND flagb=0 THEN LET score=2:
 LET flaga=1: LET total=total+sc
ore: GO TO 4055
4010 IF a=124 THEN PRINT INK 0;A
T 8,14;"B";AT 8,15;"B";AT 8,16;"
C";AT 9,15;"C": IF flagb=0 THEN
LET score=4: LET flagb=1: LET to
tal=total+score: GO TO 4055
4030 IF a=131 THEN PRINT INK 0;A
T 8,14;"B";AT 8,15;"B";AT 8,16;"
C";AT 8,17;"C";AT 8,18;"B";AT 9,
15;"C";AT 9,16;"C";AT 9,17;"C";A
T 10,16;"B": LET score=9-score:
LET total=total+score: GO TO 405
5
4040 IF a=139 THEN PRINT INK 0;A
T 8,15;"B";AT 8,16;"C";AT 8,17;"
C";AT 8,18;"B";AT 9,17;"C": IF f
lagc=0 THEN LET score=4: LET fla
gc=1: LET total=total+score: GO
TO 4055
4050 IF a=147 THEN PRINT INK 0;A
T 8,17;"C";AT 8,18;"B": IF flagd
=0 AND flagc=0 THEN LET score=2:
 LET flagd=1: LET total=total+sc
ore
4055 LET flag=flag+1
4060 RETURN
4999 REM ***** counter *****
5000 PAUSE 50
5010 LET count=count+1
5015 PRINT AT 3,3;count
5020 IF count=11 THEN GO TO 5040
5030 GO TO 30
5040 CLS : PRINT AT 10,10; FLASH
 1; INK 1;"score= ";total
5042 IF total<20 THEN PRINT AT 1
2,10; INK 1; FLASH 1;"KEEP TRYIN
G"
5044 IF total>19 AND total<40 TH
EN PRINT AT 12,10; INK 1; FLASH
1;"GETTING BETTER"
5047 IF total>39 AND total<60 TH
EN PRINT AT 12,10; INK 1; FLASH
1;"GOOD"
5050 IF total>59 AND total<75 TH
EN PRINT AT 12,10; INK 1; FLASH
1;"VERY GOOD"
5052 IF total>74 AND total<90 TH
EN PRINT AT 12,10; INK 1; FLASH
1;"EXCELLENT"
5053 IF total=90 THEN PRINT AT 1
2,10; INK 1; FLASH 1;"FANTASTIC"
5055 PAUSE 200
5060 CLS : PRINT AT 10,2;"Do you
 wish to continue(y/n)"
5070 IF INKEY$<>"y" THEN IF INKE
Y$<>"Y" THEN IF INKEY$<>"n" THEN
 IF INKEY$<>"N" THEN GO TO 5070
5080 PAUSE 0: IF INKEY$="y" OR I
NKEY$="Y" THEN GO TO 5090
5085 CLS : FOR e=1 TO 130: PRINT
 INK RND*6;" Bye ";: NEXT e
5087 STOP
5090 IF total>hi THEN LET hi=tot
al: GO TO 5100
5095 GO TO 10
5100 CLS : PRINT AT 5,0;"Well do
ne you have beaten the"'" high s
core.Enter your name"'"(8 letter
s max.) and press enter"
5110 INPUT a$
5120 GO TO 10
5999 REM **** intro ****
6000 CLS : PRINT INK 2; FLASH 1;
AT 10,11;"SKITTLES"
7000 LET a=.2: LET b=.4
7010 BEEP a,5: BEEP a,3: BEEP b,
1
7020 BEEP b,1: BEEP a,1: BEEP a,
3: BEEP a,5
7030 BEEP a,6: BEEP b,8: BEEP b,
5: BEEP a,8: BEEP a,5
7040 CLS : PRINT AT 10,3;"Do you
 require instructions?";AT 11,15
;"(y/n)"
7050 LET a$=INKEY$
7060 IF a$<>"y" THEN IF a$<>"Y"
THEN IF a$<>"n" THEN IF a$<>"N"
THEN GO TO 7050
7070 IF a$="y" OR a$="Y" THEN GO
 TO 7090
7080 GO TO 5
7090 CLS : PRINT AT 8,0;"You bow
l twice in each frame"'"unless y
ou clear first time.": PRINT : P
RINT : PRINT "Each game consists
 of 10 frames.": PRINT : PRINT :
 PRINT "Press z to stop the arro
w."
7100 PRINT AT 20,0; FLASH 1;"PRE
SS ANY LETTER"
7110 IF INKEY$="" THEN GO TO 711
0
7115 GO TO 5
```

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Problem page

Peter Shaw, programming supremo, answers your questions and offers advice on your computing techniques.

Dear Peter,
I am having an increasingly annoying problem with my ZX Spectrum computer. Having to change plugs when loading and saving is not only tiresome, but is making the plugs loose and unreliable. I have heard that it is possible to put some kind of resistor in the computer so that both plugs can be left in at the same time. Do you know of this method, and if so could you enlighten me a little.

Steve Kaul,
Welling, Kent

Steve,
You are right, it is possible to use a resistor to achieve what you want. You will need a 330Ω resistor between the signal and earth leads of the EAR plug. As the jack supplied with the Spectrum is moulded, you will need to either buy another lead or another jack; if you do the latter, solder the resistor across the contacts when you connect it. You can get more information from the shop where you buy the resistor.

Dear Peter,
I have my Spectrum linked up to a colour television via a VCR. At the computer club I attend I have been told that I could send a composite signal directly into the recorder, and so get a better picture. Is this true? And if so, could you give me the details as to what is required.

Daniel Elliot,
Ashford, Middlesex

Daniel,
It is possible to send a composite signal directly into your VCR by jumping the modulator. What you will need is:

Two metres of co-axial wire
Two male BNC connecting plugs
One female panel-mounting BNC plug
A few short lengths of coated wire

Open your Spectrum and find the modulator — it is the silver box in the top left-hand corner as you open it. There should be two wires coming out of the box on the left-hand side. Solder a short length of wire to this, being careful not to touch the circuit board or chips with the soldering iron. Solder another length of wire directly onto the metal box itself. Then, connect the two wires which you have just soldered to the female BNC plug. Make a hole next to your ordinary TV output and fix the panel-plug in the hole. Connect the two male BNC plugs together via the co-axial cable. Plug one end into the 'VIDEO OUT' socket of your VCR and the other end into the BNC plug on your Spectrum. Select the video channel on your TV and press the AUX button on your VCR. You should (because it worked with mine!) see the Spectrum copyright logo (that is if your Spectrum is turned on).

Dear Peter,
I wish to use by Spectrum as a word processor. Can you suggest the necessary hardware/software I will need to do this.

Sophie Gumpel,
London NW6

Sophie,
The software side is easy. Tasword Two is, in my opinion, really the only word processor you need look at — I use it quite extensively and have had no problems at all. The hardware side is a little more difficult — the first job is to get the necessary interface for your Spectrum (one of the better ones is the Kempston Centronics Interface but there are others on the market). The type of printer is the next step. I would suggest something that is within your budget, works with your interface and has the presentation you require. At the bottom end of the market are the cheap dot-matrix type printers which are quite fast and cheap, but are not really all the good for sending letters to the bank manager. A little more expensive are the daisywheels which have excellent quality. But what you gain in quality you lose in speed — the average printing speed of a daisywheel is about 13 cps (characters per second). At the top end of the market you can get fine dot-matrix printers and daisywheels which not only have high quality printout but also are fast — these are usually expensive though.

Dear Peter,
This summer holiday, when I went to Geneva, I bought a

Sinclair Spectrum 16K. I tried to load the introductory side 'a' and side 'b' but the computer always replied with a 'R Tape loading error' message, and I could not save any programs. I have also tried saving and loading with only two leads attached. However, this did not work either. Can you help with this problem.

Maung Mjal,
Panchsheila Pk.,
New Delhi, India.

Maung,
This is a classic problem among Sinclair computer owners — ever since Sinclair Research brought out the Mark 14 there has been the 'Sinclair saving' syndrome. Although Sinclair Research improved the chances of loading with the Spectrum, there are still a few quirks you could try, such as only using two plugs at a time; keeping the cassette recorder well away from the TV, or any other electrical appliance which might cause interference like the radio, etc; using quality, short length, computer tapes; and lastly, keeping your fingers crossed!

Dear Peter,
I have owned a ZX81 computer with 16K RAM pack for three months now and a month ago I started getting loading problems, where halfway through the program the machine suddenly stopped loading and the cursor refused to appear. In other cases, the cursor appeared, except that it was an 'L' instead of a 'K'. The LOAD and SAVE works fine without the RAM pack. Could you tell me the solution to all my problems?

Nicholas McLean,
Dunbartonshire, Scotland

Nicholas,
This could be a case of 'RAM Pack Wobble', as it is known in the trade. If so, keep your computer on a firm flat base at all times, and try not to make any sudden movements at the keyboard. If 'RPW' is not the problem then I would suspect that there is something wrong with one of the chips in your RAM pack. As this chip is filled with information during loading, it cannot accept it and the computer goes ito crash mode. If you think this might be the reason behind your lack of loading success, send the RAM pack back to be replaced.

Dear Peter,
I have had a 48K Spectum for about six weeks now and I have to say that it is a fantastic little machine. The only thing that mars my enjoyment is the sound, but I am hoping to correct that by adding the Fuller Master Unit shortly. However, that is not why I am putting pen to paper.

I'm learning BASIC pretty well and I have learned to put a program together to build up a TV picture and then save the resulting TV screens on the end of an existing program to give a nice display while loading, like the commercial software. And like the commercial software, I have printed the usual *'Press any Key to Begin'*, but unlike the commercial software, mine does not work! The only way I can run the main program is to break into the 'screens' program and then press RUN as normal. My problem is once the 'screns' program is run and saved, it no longer seems to recognise any other lines, ie IF INKEY$ = etc. So, if you could help me to run the main program after the program and 'screens' program have been loaded, I'd be much obliged.

Bryn Cheadle,
Clifton, Manchester

Bryn,
May I first say what an excellent choice of sound units you have made, I think the Fuller range definitely to be the best. To deal with your problem, I first of all trust that your screen is in fact, a saved SCREEN$, ie the picture is saved as SAVE "name" SCREEN$. If not, then read Chapter 20 (page 105 of edition 3) of your manual. Most commercial software incorporate what is called a 'loader', that is, a program which is only used to load and run the software. First of all, write a loader similar to this one:

```
10 REM ZX Computing loader
20 LOAD "ZX" SCREEN$
30 PRINT AT 21,0;;
40 LOAD "Computing"
```

Your SCREEN$ should have the file name "ZX" and saved directly after the loader. Your main program should start off:

```
10 REM MAIN PROGRAM
20 PRINT AT 21,0;"
   PRESS ANY KEY TO
   BEGIN"
30 IF INKEY$ = "" THEN
   GOTO 30
40 REM REST OF PROGRAM
```

And should be saved in the following way:

```
SAVE "Computing"LINE 10
```

Remember not to include the 'Press any key to begin' business in the saved SCREEN$ — this is printed on the bottom line at the start of the main program. Also, remember that as there will be things printed on the bottom line of the screen, don't include any of the picture in that area.

Dear Peter,
We are writing to inform you of a cure for the Spectrum 'buzz' and also its attendant overheating problem as brought to your attention by Christopher Hooby in the July/ June issue of *ZX Computing*.

We are marketing the 'P.R. Adaptor' for both the Spectrum and ZX81 at a cost of £8.95 including P&P. This unit simply plugs in place, with no soldering or dismantling necessary and is an effective cure for both the 'buzz' and overheating.

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Mr Lane,
Thank you for that piece of information, I think you have chosen the right product. To all our readers who think that their machine is really for frying eggs on or scaring away the crows, watch ZX Computing for a full review of this product in the near future.

To all of you who wish to start your computer club, please remember tht you can get one of the Staines and Stanwell Computer Club's information sheets on starting your own club by sending an SAE to:

Computer Club Info Sheet,
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ZX Computing,
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Christmas card

All the season's greetings from Clyde Bish of Exeter.

Have you thought of sending someone a cassette-based Christmas card this year? If you have, you may like to have a look at one I will be sending to someone this year! The program makes use of the Spectrum's high resolution graphics and user-defined graphics. You'll also find that colour and the much-maligned BEEP function have been extensively utilised.

Paging Santa

There are four 'pages' to this card — these start at lines 3, 50, 200 and 399 in Program 2.

The first screen gives a seasonal greeting in large letters (courtesy of Uncle Sir Clive's Horizon tape) whilst the PAPER colour scrolls. A line of bells then appears between the message, and rings out a Christmas chime.

The program then takes on a more serious note as the screen changes to show the stable at Bethlehem, with a starry sky above. The song 'O Little Town Of Bethlehem' can be heard while the stars above twinkle. The interior of the stable can be seen to brighten as the birth of baby Jesus takes place, and the Star of Bethlehem appears over the stable. Star beams appear to reach down from the star and shimmer as the computer launches into a rendition of 'Away In A Manger'.

The third screen shows a Christmas tree with candles and a star nestled within its branches. The candles are then lit and the star begins flashing, and 'We Wish You A Happy Christmas' is played. Following a series of messages in which you are invited to guess who is about to come on-screen, complete with reindeer and sleigh comes Santa with messages of peace and goodwill.

The final screen gives the message 'God Bless' bordered by holly leaves and berries, to the accompaniment of the hymn 'Silent Night'.

Greetings . . .

To use the program, first load the "walls" program from the Horizons tape, then enter NEW. Don't worry, you only want the machine code routine — and that's safe above RAMtop. Now, type in Program 1, RUN it and enter the numbers in Fig. 1, reading across the lines. Enter NEW again, and type in Program 2.

Here are some notes to help you type in the program:

1 - The capital letters within the quotes in lines 38, 55, 80, 200, 260, and at the beginning of line 305, are the user-defined graphics and should be entered in graphics mode.

2 - In line 400, the variables, x$ and y$, have to be entered using colour control characters. Type in LET x$=" (followed by the following sequence of key presses — don't enter the '/' characters as these have only been included to space the different key presses)"

"E Mode Caps Shift 4/Graphics Mode I/E Mode Caps Shift 2/ Graphics Mode J/E Mode Caps Shift 4/Graphics Mode H/E Mode Caps Shift O/"

Similarly, after LET y$=", use the above sequence, but substitute Graphics Mode H for Graphics Mode I, and Graphics Mode I for Graphics Mode H.

3 - Line 450 goes to itself to prevent an error message appearing. You could replace this with STOP, or RUN if you wanted the program to keep repeating.

To save the program on tape, use the command:

SAVE "xmas" LINE": SAVE "xg" CODE USR "a", 168: SAVE "xc" CODE 32256, 300

When loaded, the program autoruns, firstly loading in the user-defined graphics bytes and the machine code before starting the display.

As written the program occupies almost all of the available space in a 16K Spectrum and the program takes about three and a half minutes to RUN.

If you don't like the messages or prefer other tunes in the program, then change them! I have made the program as general as possible, but if you want to change the messages to make them more personal, then just remember you can only have eight letters maximum for each word.

Happy Christmas, everybody.

Fig. 1.

```
0 0 0 0 0 0 4 7
7 14 10 4 60 142 254 255
128 0 0 120 248 248 252 252
0 0 1 0 0 0 0 0
96 192 224 125 126 62 33 65
15 31 63 255 126 60 24 8
240 248 252 255 126 60 24 16
11 15 62 63 252 124 240 208
208 240 124 252 63 62 15 11
0 0 16 0 32 4 0 0
0 68 72 112 72 66 66 0
0 64 64 64 64 64 126 0
3 15 63 255 255 63 15 3
1 3 7 15 31 63 127 255
128 192 224 240 248 252 254 255
0 0 0 0 64 32 64 32
1 1 3 3 255 127 63 31
0 0 0 0 4 2 4 2
128 128 192 192 255 254 252 248
31 63 127 255 3 3 1 1
248 252 254 255 192 192 128 128
```

Program 1.

```
  10 FOR n=0 TO 167: INPUT i: PR
INT i: POKE USR "a"+n,i: NEXT n
```

Program 2.

```
   1 BRIGHT 0: GO TO 3
   2 CLEAR 32255: LOAD ""CODE US
R "a": LOAD ""CODE 32256
   3 BORDER 5: PAPER 5: CLS : IN
K 7: LET p$="Season's": LET yy=2
5: LET xs=4: LET ys=6: GO SUB 30
00: LET p$="Greeting": LET yy=10
0: GO SUB 3000
   5 PAUSE 50
  33 FOR n=1 TO 5: FOR i=0 TO 21
: PRINT AT i,0; OVER 1; PAPER n;
"
  ": NEXT i: NEXT n
```

```
 34 PAUSE 50: OVER 0
 37 PRINT AT 10,2; INK 6;"██████
██████████████████████████"
 33 FOR n=1 TO 6: PRINT AT 11,2
; PAPER 5; INK 1;"F  "; INK 2;"G
 "; INK 1;"F  "; INK 2;"G  "; I
NK 1;"F  "; INK 2;"G  "; INK 1;"
F  "; INK 2;"G  "; INK 1;"F  ";
INK 2;"G": READ a,b: BEEP a,b: P
RINT AT 11,2; PAPER 5; INK 1;" G
"; INK 2;"F    "; INK 1;"G"; INK
 2;"F    "; INK 1;"G"; INK 2;"F
  "; INK 1;"G"; INK 2;"F    ";
INK 1;"G"; INK 2;"F ": READ a,b:
 BEEP a,b: NEXT n
 40 DATA 1.4,1,0,1,2,1,-5,1,4,1
,0,1,2,1.2,-5,.2,12,.2,11,.2,9,.
2,7,.2,5,.2,4,.2,2,1.2,0
 45 PAUSE 50
 50 BORDER 4: PAPER 1: CLS : IN
K 3
 55 PRINT AT 19,14;"N██O";AT 20
,14;"█";AT 20,15; INK 6;"██";AT
20,17; INK 3;"█";AT 21,14;"█";AT
 21,15; INK 6;"██";AT 21,17; INK
 3;"█"
 60 FOR n=1 TO 50: PLOT RND*255
,RND*140+32: NEXT n
 62 PAUSE 20
 65 RESTORE 70: FOR n=1 TO 17:
READ a,b: BEEP a,b: NEXT n
 70 DATA .75,2,.75,7,.75,7,.75,
7,.75,9,.375,11,.375,9,.375,11,.
375,12,.75,14,.75,11,.75,12,.375
,11,.375,7,.75,9,.75,9,2,7
 75 PRINT AT 20,15; INK 6; BRIG
HT 1;"██";AT 21,15;"██": PAUSE 4
0: PRINT AT 20,15; INK 7;"██";AT
 21,15;"██": PAUSE 40: PRINT AT
20,15; INK 7; BRIGHT 1;"██";AT 2
1,15;"██": PAUSE 40
 80 INK 6: BRIGHT 1: PRINT AT 0
,15;"QS";AT 1,15;"TU": PAUSE 20
 85 RESTORE 90: FOR n=1 TO 11:
READ a,b: PLOT a,b: READ a,b: DR
AW a,b: NEXT n
 90 DATA 127,157,0,-133,125,156
,-6,-133,129,156,6,-133,123,159,
-12,-136,131,159,12,-135,121,160
,-18,-160,133,160,18,-160,119,16
1,-24,-161,135,161,24,-161,117,1
67,-32,-167,137,167,32,-167
 95 LET c=.7: LET d=.35: RESTOR
E 100: GO SUB 2900: GO SUB 2900:
 RESTORE 100: GO SUB 2900: RESTO
RE 120: GO SUB 2900
 100 DATA c,0,c,5,c,5,d,7,d,9,c,
5,c,5,d,9,d,10,c,12,c,12,c,14,1.
4,10
 110 DATA d,7,d,9,c,10,c,10,c,12
,c,9,c,9,d,5,d,9,c,7,c,2,c,5,1.4
,4
 120 DATA d,7,d,9,c,10,c,10,c,12
,c,9,c,9,d,5,d,9,c,7,c,2,c,4,1.5
,5
 200 LET e=0: PAUSE 25: BRIGHT 0
: BORDER 3: PAPER 3: CLS : INK 4
 210 PRINT AT 6,15;"NO";AT 7,14;
"N██O";AT 8,14;"N██O";AT 9,13;"N
███O";AT 10,13;"N████O";AT 11,1
2;"N██████O";AT 12,12;"N██████O"
;AT 13,11;"N████████O";AT 14,11;
"N████████O";AT 15,10;"N████████
██O";AT 16,10;"N██████████O";AT
17,9;"N████████████O";AT 18,15;
INK 8;"█";AT 19,14; INK 2;"███
";AT 20,14;"███";AT 21,14;"███
"
 220 FOR i=1 TO 2: FOR n=1 TO 6:
READ a,b: PRINT AT a,b; INK 7;(
"█" AND i=2)+("█" AND i=1): NEXT
n: NEXT i
 230 DATA 7,13,9,12,11,11,13,10,
15,9,17,8,7,18,9,19,11,20,13,21,
15,22,17,23
 240 FOR n=1 TO 10: READ a,b: PR
INT AT a,b; INK 7; PAPER 4;"█":
NEXT n
 250 DATA 8,15,10,16,11,14,13,13
,13,16,14,18,15,15,16,12,16,17,1
6,19
 260 PAUSE 100: INK 6: PRINT AT
6,13;"R";AT 6,18;"P";AT 8,12;"R"
;AT 8,19;"P";AT 10,11;"R";AT 10,
20;"P";AT 12,10;"R";AT 12,21;"P"
;AT 14,9;"R";AT 14,22;"P";AT 16,
8;"R";AT 16,23;"P"
 270 PRINT AT 7,15; PAPER 4;"R";
AT 9,16;"R";AT 10,14;"R";AT 12,1
3;"R";AT 12,16;"R";AT 13,18;"R";
AT 14,15;"R";AT 15,12;"R";AT 15,
17;"R";AT 15,19;"R"
 280 FOR n=1 TO 5: GO SUB 2800:
NEXT n
 285 LET x=.4: LET y=.11: FOR j=
1 TO 30: READ a,b: BEEP a,b: GO
SUB 2800: NEXT j
 290 DATA x,2,x,7,y,7,y,9,y,7,y,
6,x,4,x,0,x,4,x,9,y,9,y,11,y,9,y
,7,x,6,x,2,x,6,x,11,y,11,y,12,y,
11,y,9,x,7,x,4,y,2,y,2,x,4,x,9,x
,6,.5,7
 300 PAUSE 25: PAPER 1: FOR n=0
TO 2: PRINT AT n,0;"
                    ": NEXT n
 301 INK 7: PRINT AT 1,7;"GUESS
WHO'S COMING?": PAUSE 100: PRINT
 AT 1,7;"HERE'S A " ; FLASH 1;"C
LUE"; FLASH 0;".......": PAUSE 8
0: PRINT AT 1,7;"
     ": PAUSE 50: FOR n=0 TO 30
STEP 3: PRINT AT 1,n; INVERSE 1;
"HO": PAUSE 10: NEXT n
 302 PAUSE 20
 305 LET m$="DEDEDEDEABC        A
 VERY MERRY CHRISTMAS AND A HAPP
Y NEW YEAR TO YOU ALL"
 310 FOR j=1 TO 3: FOR n=1 TO LE
N m$+33: PRINT AT 1,0; INVERSE (
j/2=INT (j/2)); PAPER 1; INK 7; (

 "+m$+"
        ")(n TO n+31): GO SUB 280
0: NEXT n: NEXT j
 399 PAUSE 25: BORDER 7: PAPER 7
: CLS : INK 1
 400 PAUSE 50: LET x$="IJH": LET
 y$="HJI": FOR n=1 TO 8: READ a:
 PRINT AT 0,a;x$: NEXT n: RESTOR
E 410: FOR n=1 TO 8: READ a: PRI
NT AT 21,a;y$: NEXT n
 410 DATA 0,4,8,12,17,21,25,29
 420 LET yy=32: LET p$="God": GO
 SUB 3000: LET yy=68: LET p$="Bl
ess": GO SUB 3000
 430 PAUSE 50: RESTORE 440: FOR
n=1 TO 46: READ a,b: BEEP a,b: N
EXT n
 440 DATA 1.2,7,.4,9,.8,7,2.4,4,
1.2,7,.4,9,.8,7,2.4,4,1.6,14,.8,
14,2.4,11,1.6,12,.8,12,2.4,7,1.6
,9,.8,9,1.2,12,.4,11,.8,9,1.2,7,
.4,9,.8,7,2.4,4,1.6,9,.8,9,1.2,1
2,.4,11,.8,9,1.2,7,.4,9,.8,7,2.4
,4,1.6,14,.8,14,1.2,17,.4,14,.8,
11,2.4,12,2.4,16,1.2,12,.4,7,.8,
4,1.2,7,.4,5,.8,2,4,0
 450 GO TO 450
2800 LET e=(e=0): PRINT AT 4,15;
 PAPER 3; INK 6+(1 AND e=0);"QS"
;AT 5,15;"TU": PAUSE 2: RETURN
2900 FOR n=1 TO 13: READ a,b: BE
EP a,b: NEXT n: RETURN
3000 LET xx=(256-8*xs*LEN p$)/2
3010 LET i=23306: POKE i,xx: POK
E i+1,yy: POKE i+2,xs: POKE i+3,
ys: POKE i+4,8: LET i=i+4: LET w
=LEN p$: FOR n=1 TO w: POKE i+n,
CODE p$(n): NEXT n: POKE i+w+1,2
55: LET w=USR 32256: RETURN
```

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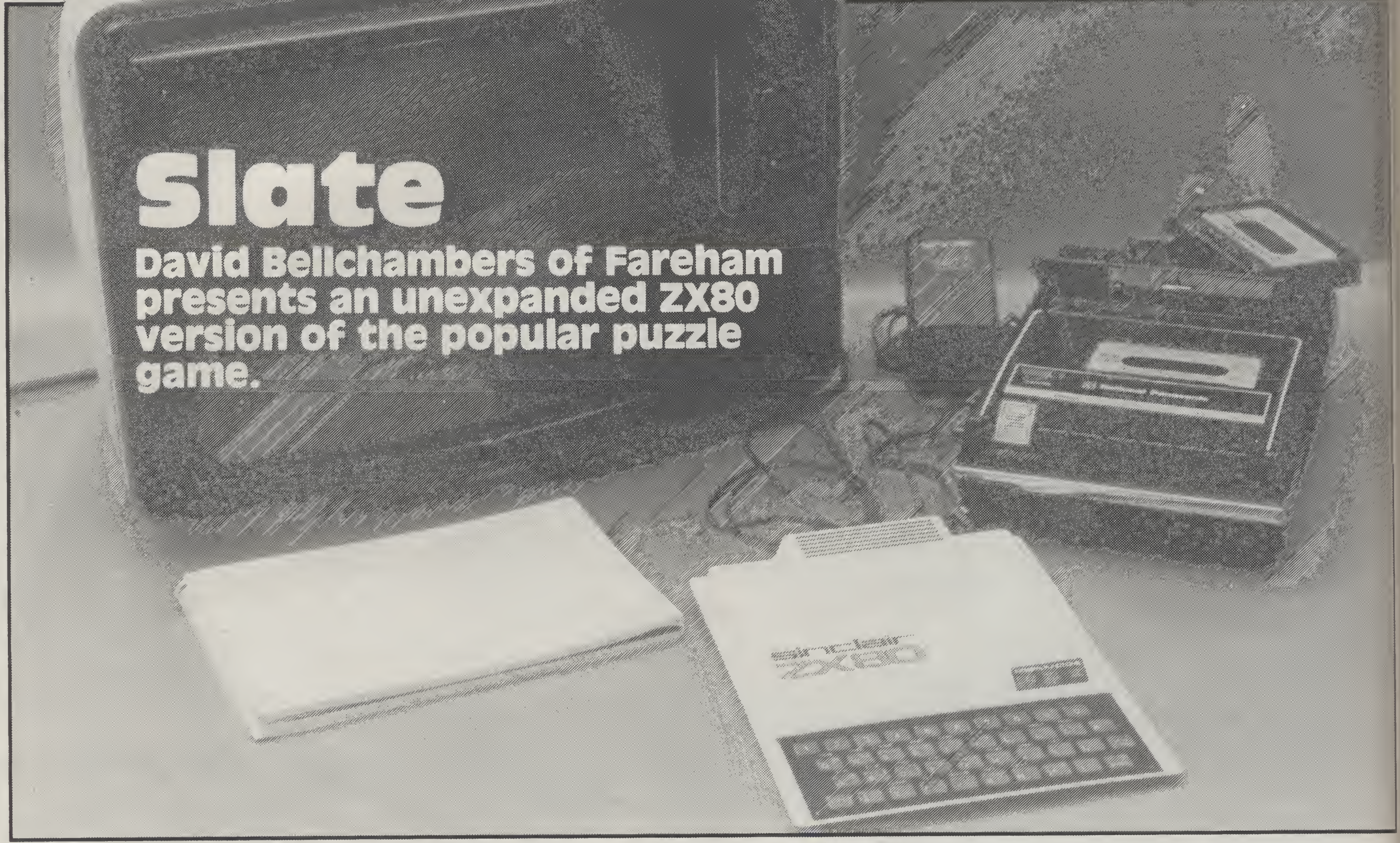
Slate

David Bellchambers of Fareham presents an unexpanded ZX80 version of the popular puzzle game.



Slate is a computer version of that once popular puzzle in which you had to move fifteen tiles around in a four by four matrix until they were all in the correct order. One of the positions in the matrix is not occupied by a tile, and this space is used to move the tiles by sliding any one of the four adjacent tiles into this space. This produces another space where the tile used to be.

When run, the program displays a grid of randomly mixed letters 'A' to 'O', but jumbled up. One of the locations contains a space. To move a tile into this space, simply enter the letter you wish to move to the prompt, 'WHICH LETTER?'. This piece will then be moved. To complete the puzzle, the top line must read 'ABCD'; the second line must read 'EFGH'; the third line must read 'IJKL'; and the bottom line must read 'MNO'; with the space in the bottom right-hand corner. The computer checks to see if you have finished after every move,and keeps track of your current score and also the high-score. The idea is to complete the puzzle in the *least* number of moves. If you try to move a piece that is not on the board (if you type 'Z', for instance) you will forfeit the game. The only other possible way of cheating is if you try to move a letter that is not directly adjacent to the space at right-angles.

```
  1 RANDOMISE
  2 LET H=32000
  3 DIM A (16)
  4 LET M=0
  5 FOR N=1 TO 15
  6 LET A (N)=N+37
  7 NEXT N
  8 LET A (16)=0
  9 FOR N=1 TO 16
 10 LET B=RND (16)
 11 LET C=A (N)
 12 LET A (N)=A (B)
 13 LET A (B)=C
 14 NEXT N
 15 CLS
 16 PRINT ''SLATE BY
D.BELLCHAMBERS''
 17 PRINT
 18 PRINT ''▗▄▄▄▄▖''
 19 FOR N=0 TO 3
 20 PRINT CHR$(130);
 21 FOR C=1 TO 4
 22 PRINT CHR$ (A(N * 4+C));
 23 NEXT C
 24 PRINT '' ▌ ''
 25 NEXT N
 26 PRINT '' ▝ '';
 27 FOR N=1 TO 4
 28 PRINT CHR$ (131);
 29 NEXT N
 30 PRINT '' ▘ ''
 31 PRINT
 32 FOR N=1 TO 15
 33 IF NOT A (N)=N+37
THEN GO TO 44
 34 NEXT N
 35 PRINT ''COMPLETED IN'';
M; ''MOVES''
 36 IF M<H THEN LET H=M
 37 PRINT
 38 PRINT ''BEST SO FAR
IS''; H; ''MOVES''
 39 PRINT
 40 PRINT, ''ANOTHER GO?''
 41 INPUT A$
 42 IF CODE (A$)=62 THEN
GO TO 4
 43 STOP
 44 PRINT ''WHICH
LETTER?''
 45 INPUT A$
 46 IF A$>''9'' AND
A$<''P'' THEN GO TO 50
 47 CLS
 48 PRINT ''CHEATS NEVER
WIN . . .''
 49 GO TO 37
 50 FOR N=1 TO 16
 51 IF NOT A (N)=CODE (A$)
THEN NEXT N
 52 FOR C=1 TO 16
 53 IF NOT A (C)=0 THEN
NEXT C
 54 IF NOT ABS (N-C)=4
AND NOT ABS (N-C)=1
THEN GO TO 47
 55 LET A (C)=A(N)
 56 LET A (N)=0
 57 LET M=M+1
 58 GO TO 15
```

Line by line

Here follows a brief description of the program functions, line by line:

Lines 1-3	Initialisation.
Line 4	Reset score.
Lines 5-8	Reset the board (all pieces in their winning positions).
Lines 9-14	Scramble the board up.
Lines 15-31	Display the board.
Lines 32-34	Have you finished the puzzle yet?
Lines 35-39	Yes, you have! Well done! Print score and hi-score.
Lines 40-42	Want another go?
Line 43	I guess not!!
Lines 44-45	Which letter do you want to move?
Line 46	Is it a valid piece?
Lines 47-49	No, it wasn't!
Lines 50-51	Find the letter in the grid.
Lines 52-53	Find the space in the grid.
Line 54	Is it a legal move?
Lines 55-56	Move the letter and the space around.
Line 57	Add one to the current score.
Line 58	Go back and display the new grid situation.

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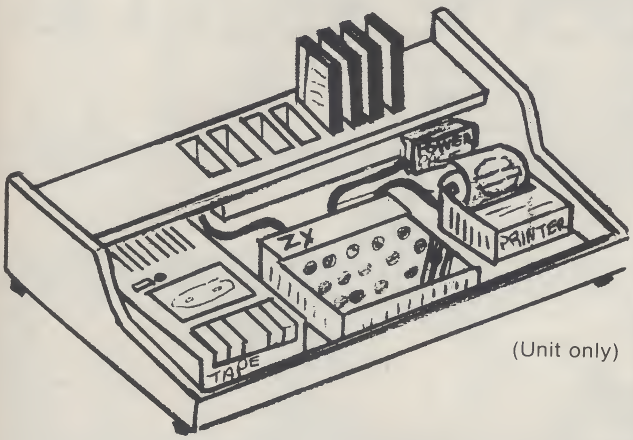

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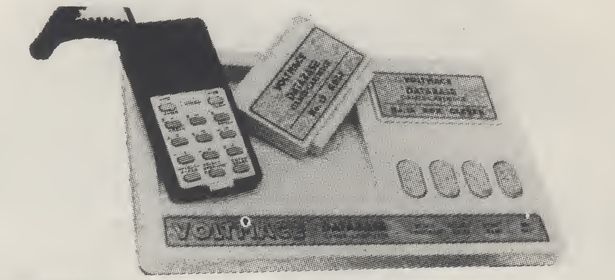

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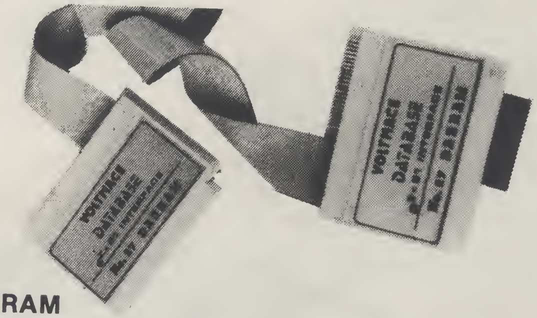

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Maths maze

A great game with an educational twist to it from Nick Brown of Burgess Hill.

At the start of the game you must select a level of difficulty, from one to five, five being the hardest and almost impossible. The object of the game is to move around the maze, you being the inverse quotes, using the arrow keys, '5' to '8', until you find one of the signs: '+', '−', '*' or '/'. When you find one of these signs, you simply 'eat' it. The computer will then clear the screen, and set you five questions, their hardness depending on the level of difficulty selected at the start of the game. After these five questions, you are given a 'percentage rating', depending on how many sums you answered correctly. After this, press any key and the faithful ZX81 will put you back in the maze to carry on the game.

On leave

You may leave the maze at any time, but obviously the idea is to get as many points as possible. You get one point for each correctly answered addition or subtraction question, and two points for each multiplication or division question.

At the end of each game (when you have reached the exit), you are told your score and given three options: to play again at the same level, to stop, or to play again at a different level.

Your movement around the maze is quite fast for a BASIC program; this is due to the shortness of the loop (lines 100 to 300) and because the main work is done by subroutines.

Type in the program as published, then before RUNing the game, type the following:

POKE 16510,0

Program description

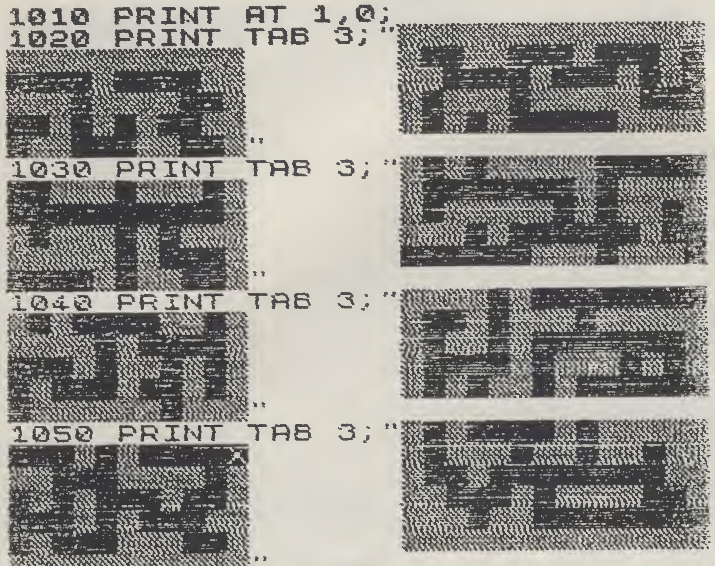
Here follows a breakdown of the program's operation:

Lines 100-300	Main routine,
Lines 1000-1080	Print the maze.
Lines 3000-3060	Set the sums, deciding which sums you chose.
Lines 3070-3168	Set the addition sums.
Lines 3170-3269	Set the subtraction sums.
Lines 3270-3369	Set the multiplication sums.
Lines 3370-3800	Set the division sums.
Lines 5000-5180	End of game routine.
Lines 6500-6600	Set the values for the sums.
Lines 6800-6840	Clear the screen, leaving the top line.
Lines 8000-8500	Variables routine.
Lines 8600-8900	Introduction, also set level of difficulty.
Lines 9000-9020	Load. The program will automatically run on subsequent loadings if the program is SAVEd using GOTO 9000.

```
   1 PRINT AT 0,0;" MATHS MAZE  
  NICK BROOM 1983 "
  10 GOSUB 8600
  20 GOSUB 8000
  30 GOSUB 1000
 100 REM  *** MAIN ROUTINE *** 
 110 PRINT AT A,B;"""
 120 PRINT AT A,B;" "
 130 LET A$=INKEY$
 150 LET A1=A
 160 LET B1=B
 170 LET A=A+(A$="6" AND A<20)-(
A$="7" AND A>2)
 180 LET B=B+(A$="8" AND B<27)-(
A$="5" AND B>3)
 190 LET PEEK=PEEK (P+33*A+B)
 200 IF PEEK=128 THEN GOTO 100
 210 IF PEEK=189 THEN GOTO 5000
 220 IF PEEK<>8 THEN GOSUB 3000
 230 LET A=A1
 240 LET B=B1
 300 GOTO 100
1000 REM  *** MAZE *** 
```

▶

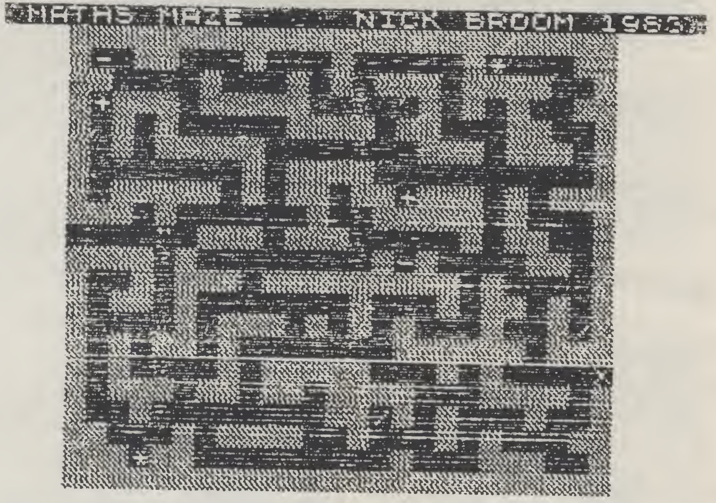
```
1010 PRINT AT 1,0;
1020 PRINT TAB 3;"
"
1030 PRINT TAB 3;"
"
1040 PRINT TAB 3;"
"
1050 PRINT TAB 3;"
"
```



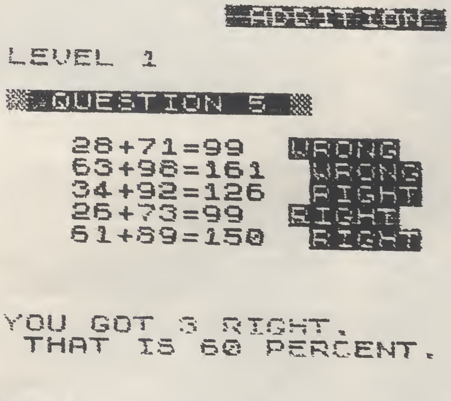
```
1060 PRINT AT 2,4;"■";AT 2,22;"■
";AT 4,4;"■";AT 8,18;"■";AT 11,1
8;"■";AT 14,26;"■";AT 18,17;"■";
AT 20,6;"■"
1080 RETURN
3000 REM *** SET SUMS ***
3010 LET QUES=DIFF*50
3020 FOR X=1 TO 21
3030 PRINT AT X,0;"
"
3040 NEXT X
3050 PRINT AT 4,0;"LEVEL ";DIFF
3060 GOTO (PEEK-149)*100+3070
3070 REM + ADDITION +
3075 LET COR=0
3080 FOR X=1 TO 5
3090 GOSUB 6500
3100 PRINT AT 2,10;" ADDITION "
3110 PRINT AT 6,0;"▒ QUESTION ";
CHR$ (X+156);"■▒"
3120 PRINT AT 7+X,3;Q1;"+";Q2;"=
";
3130 INPUT B$
3135 IF B$="" THEN GOTO 3130
3140 IF VAL B$=Q3 THEN PRINT B$;
"   RIGHT"
3145 IF VAL B$=Q3 THEN GOTO 3157
3155 PRINT Q3;"  WRONG"
3157 IF VAL B$=Q3 THEN LET COR=C
OR+1
3160 NEXT X
3162 LET SCORE=SCORE+COR
3163 PRINT ,,,,,,"YOU GOT ";COR;
" RIGHT."," THAT IS ";COR*100/5;
" PERCENT."
3164 PRINT ,,,,"PRESS ""N/L"" TO
 CONTINUE..."
3165 IF INKEY$="" THEN GOTO 3165
3166 GOSUB 6800
3167 GOSUB 1000
3168 RETURN
3170 REM + SUBTRACTION +
3175 LET COR=0
3180 FOR X=1 TO 5
3190 GOSUB 6500
3200 PRINT AT 2,8;" SUBTRACTION 
"
3210 PRINT AT 6,0;"▒ QUESTION ";
CHR$ (X+156);"■▒"
3220 PRINT AT 7+X,3;Q1;"-";Q2;"=
";
3230 INPUT C$
3235 IF C$="" THEN GOTO 3230
3240 IF VAL C$=Q3 THEN PRINT C$;
"   RIGHT"
3245 IF VAL C$=Q3 THEN GOTO 3257
3255 PRINT Q3;"  WRONG"
3257 IF VAL C$=Q3 THEN LET COR=C
OR+1
```

```
3260 NEXT X
3262 LET SCORE=SCORE+COR
3263 PRINT ,,,,,,"YOU GOT ";COR;
" RIGHT."," THAT IS ";COR*100/5;
" PERCENT."
3264 PRINT ,,,,"PRESS ""N/L"" TO
 CONTINUE..."
3265 IF INKEY$="" THEN GOTO 3265
3266 GOSUB 6800
3267 GOSUB 1000
3269 RETURN
3270 REM + MULTIPLICATION +
3272 LET COR=0
3273 FOR X=1 TO 5
3275 LET Q1=INT (RND*(DIFF*3)+5)
3277 LET Q2=INT (RND*(DIFF*3)+10
)
3280 LET Q3=Q1*Q2
3290 PRINT AT 2,8;" MULTIPLICATI
ON "
3295 PRINT AT 6,0;"▒ QUESTION ";
CHR$ (X+156);"■▒"
3300 PRINT AT 7+X,3;Q1;"*";Q2;"=
";
3310 INPUT D$
3315 IF D$="" THEN GOTO 3310
3320 IF VAL D$=Q3 THEN PRINT D$;
"   RIGHT"
3325 IF VAL D$=Q3 THEN GOTO 3350
3330 PRINT Q3;"  WRONG"
3350 IF VAL D$=Q3 THEN LET COR=C
OR+1
3355 NEXT X
3357 LET SCORE=SCORE+COR*2
3360 PRINT ,,,,,,"YOU GOT ";COR;
" RIGHT."," THAT IS ";COR*100/5;
" PERCENT."
3362 PRINT ,,,,"PRESS ""N/L"" TO
 CONTINUE..."
3363 IF INKEY$="" THEN GOTO 3363
3365 GOSUB 6800
3368 GOSUB 1000
3369 RETURN
3370 REM + DIVISION +
3372 LET COR=0
3374 FOR X=1 TO 5
3375 LET Q1=INT (RND*(DIFF*5)+10
)
3377 LET Q2=INT (RND*(DIFF*5)+10
)
3380 LET Q3=Q1*Q2
```

```
3390 PRINT AT 2,10;" DIVISION "
3395 PRINT AT 6,0;"▒ QUESTION ";
CHR$ (X+156);"■▒"
3400 PRINT AT 7+X,3;Q3;"/";Q2;"=
";
3410 INPUT E$
3415 IF E$="" THEN GOTO 3410
3420 IF VAL E$=Q1 THEN PRINT E$;
" RIGHT"
3425 IF VAL E$=Q1 THEN GOTO 3435
3430 PRINT Q1;"  WRONG"
3435 IF VAL E$=Q1 THEN LET COR=C
OR+1

3440 NEXT X
3450 LET SCORE=SCORE+COR*2
3460 PRINT ,,,,,,"YOU GOT ";COR;
" RIGHT.","THAT IS ";COR*100/5;
" PERCENT."
3462 PRINT ,,,,"PRESS ""N/L"" TO
 CONTINUE..."
3463 IF INKEY$="" THEN GOTO 3463
3470 GOSUB 6800
3480 GOSUB 1000
3800 RETURN
5000 REM  *** THE END *** 
5010 GOSUB 6800
5020 PRINT AT 8,0;" YOU HAVE REA
CHED THE EXIT. "
5030 PRINT ,," YOU SCORED ";SCOR
E;" POINTS ON LEVEL ";DIFF
5065 PRINT ,,"PRESS :",,"""P"" T
O PLAY",,"""S"" TO STOP",,"""R""
 TO CHANGE LEVEL."
5070 IF INKEY$="" THEN GOTO 5070
5080 IF INKEY$="S" THEN STOP
5090 IF INKEY$="P" THEN GOTO 511
0
5095 IF INKEY$="R" THEN GOTO 516
0
5100 GOTO 5070
5110 GOSUB 6800
5120 LET SCORE=0
5130 LET A=10
5140 LET B=3
5150 GOTO 30
5160 GOSUB 6800
5165 PRINT AT 6,0;
5170 GOSUB 8660
5180 GOTO 20
6500 REM  * SET VALUES * 
6510 LET Q1=INT (RND*QUES)+20
6520 LET Q2=INT (RND*QUES)+50
6530 IF PEEK=149 THEN LET Q3=Q1+
Q2
6540 IF PEEK=150 AND Q1<Q2 THEN
GOTO 6500
6550 IF PEEK=150 THEN LET Q3=Q1-
Q2
6600 RETURN
6800 REM  * CLEAR SCREEN * 
6810 FOR X=1 TO 21
6820 PRINT AT X,0;"
                    "
6830 NEXT X
6840 RETURN
8000 REM  *** VARIABLES *** 
8010 LET A=10
8020 LET B=3
8030 LET P=PEEK 16396+256*PEEK 1
6397+1
8040 LET COR=0
8050 LET SCORE=0
6500 RETURN
8600 REM  *** INTRO *** 
8640 PRINT AT 4,0;" YOU (A """■""
) ARE IN A MAZE AND  YOUR TASK I
S TO GET TO THE EXIT (▩). "
8650 PRINT " ON YOUR WAY YOU MUS
T PICK UP  THE SIGNS (+,-,*,/)
AND ANSWER  THE CORRESPONDING QU
ESTIONS."
3655 PRINT ,,"   TO MOVE USE:
  7",,"                    5■8",,"
    6"
8660 PRINT ,,,,"PLEASE ENTER LEV
EL OF DIFFICULTY"
8670 PRINT ,,"   FROM 1 TO 5 (1-
EASY/5-HARD)"
8680 LET A$=INKEY$
8690 IF A$="" THEN GOTO 8680
8695 IF A$="1" OR A$="2" OR A$="
3" OR A$="4" OR A$="5" THEN GOTO
 8700
8697 GOTO 8680
8700 FOR X=1 TO 18
8710 PRINT AT X,0;"
                    "
8720 NEXT X
8730 LET DIFF=VAL A$
8900 RETURN
9000 REM  *** LOAD N GO *** 
9010 SAVE "MAZE"
9020 RUN
```

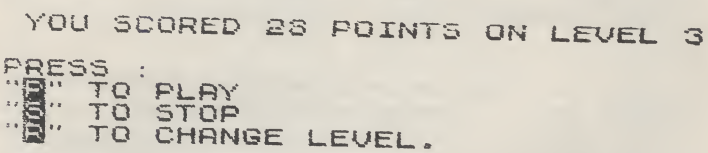


A screen illustration of the maze in action.



```
            ADDITION

LEVEL 1

▒ QUESTION 5 ▒

     28+71=99    WRONG
     63+98=161    WRONG
     34+92=126    RIGHT
     26+73=99    RIGHT
     61+89=150    RIGHT


YOU GOT 3 RIGHT.
 THAT IS 60 PERCENT.


PRESS "N/L" TO CONTINUE...
```

An example addition test for someone playing the Maths maze at level one.



```
 YOU SCORED 28 POINTS ON LEVEL 3

PRESS :
"P" TO PLAY
"S" TO STOP
"R" TO CHANGE LEVEL.
```

When you have finished playing on one level, you are presented with your score and given the option to play again, stop playing or to change level.

New books and software are cropping up everywhere. Here's the pick of the bunch.

MASTERING THE ZX SPECTRUM

by **Lawrie Moore**

This book is about how to enjoy your Spectrum through learning programming and handling the machine: it dispels the mental block which sometimes occurs for beginners, that of grasping and understanding the building of a program.

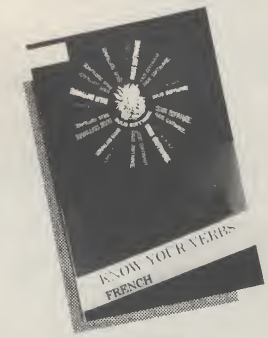
December '83 approx. 150pp
085312 700 X £5.95
Published by Ellis Horwood Ltd., Chichester, and marketed by John Wiley & Sons Ltd.

WORDPOWER
Vocabulary and Spelling

by **Sulis Software**

WORDPOWER is a powerful package containing more than 1200 words, including opposites, synonyms, nouns/adjectives, collectives and similes. A choice of two games, plus a key-in option and different levels of difficulty make up a compulsive package — and you'll soon find you're packing a new punch with words you've never known how to use before.

Cassette
0946658021 £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.



TENSE FRENCH
Know Your Verbs

by **Sulis Software**

TENSE FRENCH teaches you how to get those basic French verbs right. The little beasts are translated, listed and tested, so that whether you've a gift for languages or not, they won't bother you again.
Working in the tense of your choice, *you* decide whether you want to be tested, when and what on.

Cassette
0946658552 £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.

SPELLBOUND: BESIEGED
Spelling

by **Sulis Software**

Can you get your crusading knights across the ravine to relieve the beleaguered city — or will the infidels get there first? Every word spelt right in this game is a safe crossing for one of your knights. Spell a word wrong, and the infidels will have an advantage over you.

Cassette
0946658048 £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.

DYNAMIC GAMES FOR THE ZX SPECTRUM

by **Tim Hartnell**

This book provides 20 dynamic games of lasting interest. They range from board games like *Chess* and *Pirandello*, to arcade action in *Jogger* and *Deathrace 2000*, and include a major adventure game, *Revenge of Castle Dread*.
A detailed introduction is provided for every game.

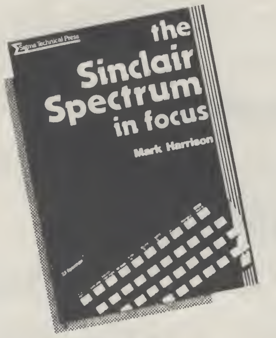
186pp
0946195137 £5.95
Published by Sinclair Browne Ltd. and marketed by John Wiley & Sons Ltd.

THE MICRO CLOAK AND DAGGER BOOK
Codes and Cryptography on Sinclair Microcomputers

by **Gareth Greenwood**

Cryptography is an absorbing subject which has had a steady amateur following for many years, particularly amongst young, technically minded schoolboys. The advent of cheap, personal computers now makes it possible for the interested person to experiment directly with codes and ciphers using the machine as an encryption device. This book is oriented around the use of a computer for practical experi mentation.
Contents include: Secret Communications, ZX81 As a Cipher Machine, Simple Cipher Systems, Solving Simple Substitution Ciphers, Less Simple Transpositions, Breaking Transposition Codes, Tougher Ciphers, Cipher Security,

December '83 approx. 150pp
0905104 498 approx. £6.95
Published by Sigma Technical Press and marketed by John Wiley & Sons Ltd.



THE SINCLAIR SPECTRUM IN FOCUS

by **Mark Harrison**

This book supplements the Sinclair operating manual providing answers to some of the questions posed but left unanswered. It is designed for readers of all ages with either no previous computer experience or those requiring more assistance.

198pp
0905104 285 £6.25
Published by Sigma Technical Press, and marketed by John Wiley & Sons Ltd.

SINCLAIR SPECTRUM AND ZX81 ADD-ONS
Microcomputer Hardware Projects

by **Natasha Graham** and **Michael Roberts**

Contains all you need as an introduction to microcomputer interfacing, hardware design and machine code programming. The Sinclair computers are well known for running simple BASIC programs and for game playing but how many people have used them for hardware projects? — one of the most exciting areas — actually getting a micro to do something useful. This book takes you step-by-step from nervously switching on the soldering iron, through to challenging projects such as controlling lights, switches and simple video games. Through these projects, machine code programs are written which control the external hardware.

December '83 approx. 150pp
0905104 641 approx. £6.95
Published by Sigma Technical Press and marketed by John Wiley & Sons Ltd.

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The best three of '83

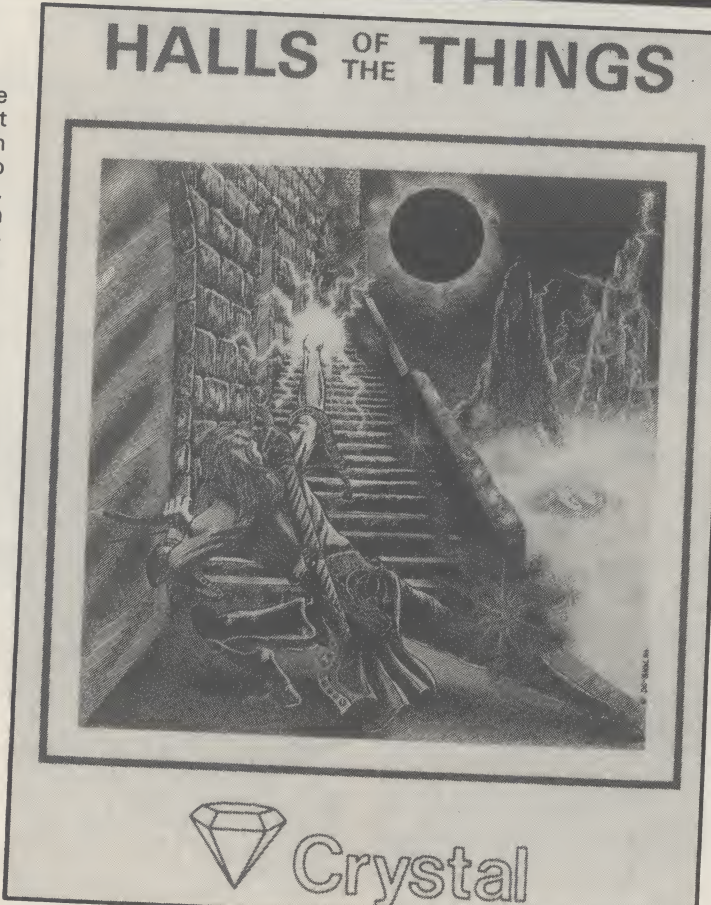
Nick Pearce and James Walsh take a fond look back at the three best software packages they've seen during 1983.

The Spectrum overview

A lot has happened on the micro scene during the last twelve months. The Acorn Atom has at last been laid to rest, and the Electron, Aquarius and Memotech micros have emerged. One thing that has solidly held its ground whilst others come and go is the Spectrum.

Not that the Spectrum fraternity has been standing still! During the last year Ultimate has blasted its way onto the scene. Imagine have consolidated their lead as the software company with most money and biggest gimmicks. Crystal have risen to be one of the most prestigious software houses in the UK. The list of events goes on . . . As far as software is concerned '83 must be counted as the most astounding so far.

For no other computer has there ever been such an influx of better and better quality software. It is definitely significant when looking at the titles which I have chosen to include in my 'Hall of Fame '83' that they have all been put on the market during the latter half of the year. Much of the software introduced between this time last year and the summer has now been noticeably outdated, one of the main exceptions being 'The Hobbit' by Melbourne House. This partly being due to the immortality of the book, but also to excellent programming.



Personally . . .

There is a good chance that you will not agree with my choice of best program, as no pure definition of a 'good' program exists. For this reason I would like to state the criteria on which I have based my choice:

1. Originality, this applying to the game scenario rather than programming gimmickry or technique.'
2. The use of the computer, whether it uses its capabilities to the full; this largely means that BASIC programs were not considered.
3. Quality of programming and initiative, whether it runs fast and smoothly, the quality of graphics and sound, etc, and the use of new ideas.
4. Playability, in that a game is of little use even if it is a programming masterpiece if no enjoyment is derived from playing it. Now down to the programs themselves.

Halls Of The Things

I shall first set the scene:

"I am standing at the bottom of eight flights of stairs leading up and up around the tower. I can see the dungeon, in which the key lies, but without the seven rings I cannot enter. I must endeavour to find the rings, though I am safe out here — eternity is a long time to wait in the cold. So here goes, up two flights of stairs, in one go. Help! There is a 'Thing' waiting for me just inside the entrance, a quick flash of lightning and he is left smouldering — close shave at that. In further and through the first door. A half full bottle of elixir on the floor. I could do with a little extra sustenance after that frightening encounter. Now on with the quest in hand. Through the next door, and there stands two more 'Things'. A quick couple of lightning bolts and a rapid exit should do the job. Hang on, that is a fireball he is using, it must be, it is following me! I can play at that game. I was lucky this time, one of their own lightning bolts rebounded and hit them. They like smouldering in amongst a pile of treasure. Might as well have the treasure whilst I am here, suppose it could come in handy. I must be getting pretty low on magic by now, I'll have a quick low at my status . . . I was right, and I'm wounded — must have taken more of a beating in the last conflict that I thought. The best thing to do is heal myself with some of my remaining magic and rely on arrows and my sword until I can find enough elixir to replenish my supplies. This maze seems to go on and on, is there an end to it, the rings must be somewhere."

An extract from 'An Addict's Guide to Things', by Arthur and C. Clark.

From the above extract you should have gained a small insight into the very intense excitement the 'Halls' involves. The idea of the game is based on the traditional 'Dungeons and Dragons Adventure' scenario. Your aim being to make your way through the multi-level maze collecting the seven rings and killing monsters as you go. Once the seven rings are found you may leave the maze, travel down the staircase to the lowest level, the dungeon. When inside you must frantically try and find your way to the key before the enormous number of 'Things' manage to get to you. Getting to the end of 'Halls' is far from an easy business. It is likely to take you weeks and weeks before even getting near.

Each level, except for the dungeon, is an enormous maze, with hundreds of rooms and corridors. Many of the rooms are enclosed by doors which may be opened or closed by either yourself or a 'Thing'. An assortment of objects may be found in a room. If you are lucky, a bottle of elixir will be lying full or partially full, on the floor. Unfortunately, the 'Things' also have an affinity for it. Elixir will boost your magic level and allow you to fire more lightning bolts and fireballs as well as healing yourself. Treasure may also be found, this may be collected and so add to your score. But beware! 'Things' may disguise themselves as treasure and suddenly attack you. The only way to check is to try and fire a lightning bolt. If a 'Thing' is in the vicinity then the lightning bolt will go for it, if not no action will be taken as lightning can only be fired if something is in the general area.

▶

The one aspect which may put people off 'Halls' on the first encounter, is the large range of controls available. It will probably take about 10 to 15 minutes before they will become second nature. Really, the game is very simple to play.

'Halls' lacks sound because of the immense amount of time which the computer would have to spend processing it, so slowing the game down to an unacceptable level. It is also difficult to control by joystick, unless you have one of the universal adaptors.

As far as I am concerned, and I have seen quite a large amount of software over the last year, this is the most exciting and innovative computer game I have seen for the Spectrum. No other game runs with such speed, smoothness of action and graphical quality. Crystal Computing have shown just how far it is possible to push the Spectrum, making some of the claims for more expensive micros, such as the 'Beeb' and Dragon, look really rather silly. The question on the tip of my tongue is whether Crystal will be No. 1 next year? It looks possible!

3D Tunnel

3D Tunnel went on the market back in the beginning of the summer. Written and marketed by New Generation Software it was first received in this magazine back in the June/July edition. Since then Malcolm Evans has also released 'Knot in 3D', another blockbuster, which was reviewed in the last edition. 'Knot' may also have figured in my 'Hall of Fame '83' had it not been for the earlier introduction of 3D Tunnel, which just pipped it to the post.

The scenario of 3D Tunnel must be the one of the most graphically ambitious I have yet seen. You are racing down to 3D tunnel infested with rats, bats, spiders and frogs! Whilst trying to steer your way through the tunnel itself you must either avoid or shoot any animals which come toward you. Finally, you have the task of avoiding a London Underground train (48K version only). The graphics for this are incredible. A sheer delight to watch. As for sound, this too is very well catered for; this is certainly a surprise considering the enormous speed at which the game runs.

As well as three speeds, you are also given the option of practice runs at certain stages of the game as well as a demo mode.

Having played 3D Tunnel for many hours I still find the fastest mode dauntingly fast, which is a good thing — who wants to be able to beat a game at its top level too quickly?

There may not be much depth to the scenario of the game, but the graphics can only be described as breathtaking. When I first saw it, I could hardly believe it was a mere Spectrum at work. The addition of a slightly cut down version at 16K is very useful, especially considering that the other two games in this 'Hall of Fame' are both for the 48K only. 3D Tunnel can be heartily recommended to all ages, especially those who wish to display the real possibilities of the Spectrum — this will stop many a 'Beeb' owner in his/her stride.

A truly professional program of outstanding quality and impact. It is so addictive that after many months of use, its fun and excitement have hardly lessened.

Manic Miner

Manic Miner is one of the latest releases by the longstanding Bug-Byte. Bug-Byte has been around on the micro scene right back since the 'old days' of the ZX80. Over the years they have built up a reputation as a highly business-like professional body, producing high quality software in colourful packaging, advertised over glossy spreads and being sold in just about every retail outlet available. Recently there have been some reservations as to the quality and originality of the individual games. Fortunatley, Manic Miner has come to dispel these. Though the packaging is of the normal professional standard, the game is the real masterpiece. I had no hesitation whatsoever when including Manic Miner in my 'Hall of Fame'.

Miner Willy is the star of the show. Whilst prospecting, he stumbles over evidence of a lost civilization far superior to our's. To maintain such a civilization it was necessary to mine vast amounts of precious minerals. When, many aeons ago the empire crumbled and this world lapsed into a dark age, no-one thought to inform the mine workers, who were in fact robots anyway. Willy realizes that there is a fortune to be made if he can find the hidden store. Your task is to guide him through the 20 underground caverns, collecting the keys so as to progress to the next cavern. Each cavern is an arcade game in itself. Apart from the problem of Manic Mining Robots who are out to get you, there are also Poisonous Pansies, Spiders, Slime, one way conveyor belts, collapsing floors and lots more besides. In each cavern, the problems are slightly different but never easy. Some of the monsters created are incredible. Each being perfectly defined and controlled.

The introduction to Manic Miner entails a display of the surface of the mine, and the home of Willy. There is also a full graphical keyboard, on which a line is played with the appropriate notes lighting up as it proceeds. Once this is over, and you have not selected to play the game, a demo mode will proceed, showing displays of all 20 caverns.

The sound is fantastic, the graphics are excellent, whilst the programming is brilliant. This must be the most colourful game I have ever seen. This is highly recommended for arcade freaks everywhere. The controls are simple — only left, right and jump — hence making it playable by anyone. Though it may take hours before proceeding past Cavern One, this in itself is a game. Manic Miner is an absolutely fantastic game — very highly recommended.

Have a very happy Christmas.

James Walsh

The ZX81 overview

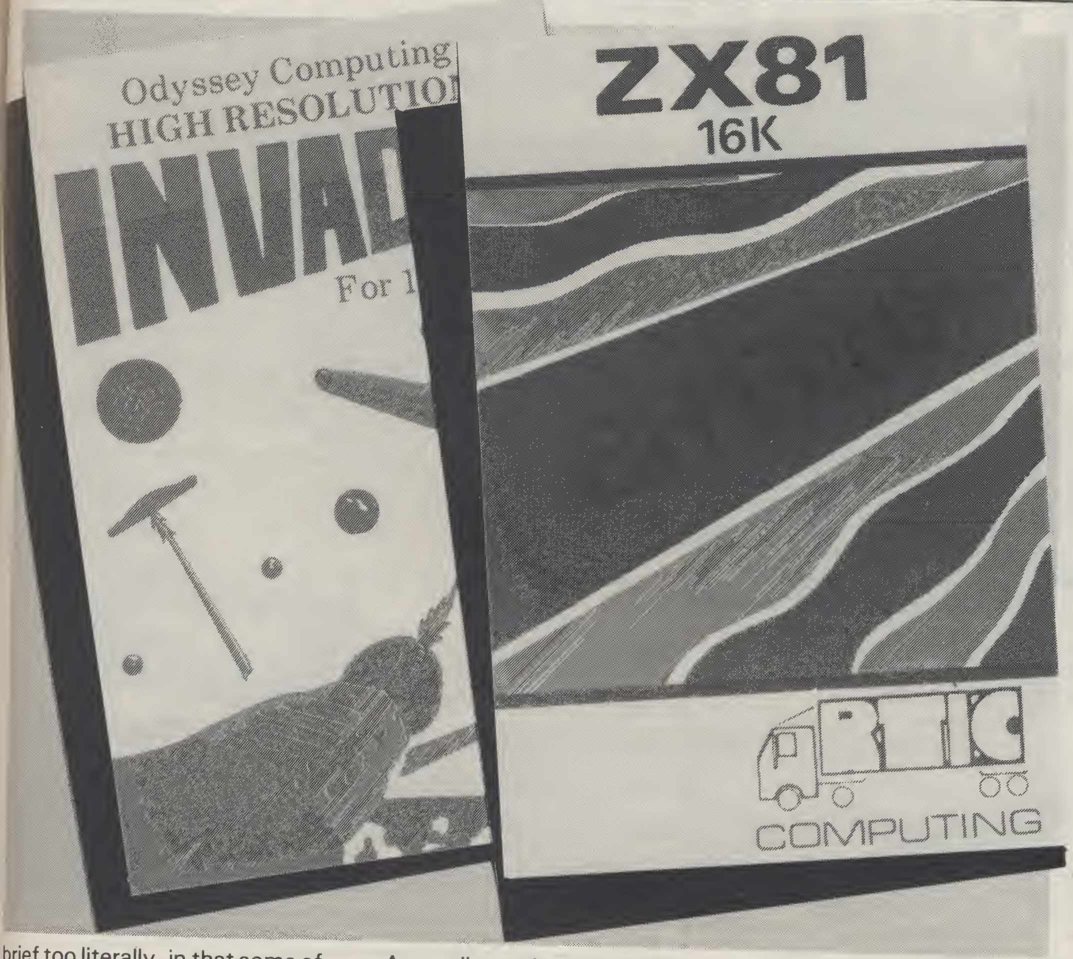
With 1983 fast drawing to a close, this is the time of year when it is traditional to look back over the past twelve months and take stock.

I have seen a considerable number of cassettes during 1983. Some have been pretty mundane, many were very good and a few were outstanding, either in terms of their originality or because they broke new ground in the software market. It must be said that many of the major advances in ZX81 software were made in 1982 — I'm afraid 1983 is unlikely to be remembered as a vintage year for software. But, then again, this is hardly surprising as the ZX Spectrum and a host of other cheap computers have been primary attractions, and the ZX81, introduced nearly three years ago and still extremely popular, is beginning to feel its age in computing terms.

Spoilt for choice?

I have chosen my three best packages using the following criteria: longevity, a program which survives constant use and remains as interesting as it first did; technical innovation, as to how well the programmer has used the capabilities of ZX BASIC and the limitations of the ZX81's memory; and originality. The kind of program that any ZX81 user would be happy to find in their Christmas stocking.

I have not interpreted my



brief too literally, in that some of the chosen three were in fact produced late in 1982 although their impact on the software market was only felt in 1983. Also, I have been unable to resist mentioning more than the stipulated three (perhaps I will be permitted to look back at four packages in '84 and five in '85!).

Equally, for fear lest this short summary become a little more than a catalogue of ZX81 software, I have not made too many references to many other great cassettes which I'm sure you will have come across this year. My selection is very much a personal one, and for the benefit of users of both the unexpanded and the expanded ZX81, I have chosen a cassette of 1K games, a 16K game and for the more experienced programmer, Artic's FORTH implementation.

The name of the game

Taking the game for the 16K ZX81 first, Odyssey's 'Invaders' package continues to provide enjoyment and I also use this game to demonstrate to sceptics that high resolution games really are feasible on the ZX81.

As well as the impressive display, the action is fast and responsive, and as a game is great fun. Only Artic's 'Namtir Raiders' comes to mind as being as exciting to play, but this version does not have the same Hi-res display.

Some users of Odyssey's game seem to have had some problems with the Hi-res display – it appears that access to the horizontal hold on the TV is sometimes necessary to correct the distortion. Persevere – you'll find it's worth it!

You could also check out some of Odyssey's other Hi-res games, which I have heard rumoured are equally good.

Someone with just 1K of RAM might appreciate a cassette such as Selec's 'Maze Guzzler' in their Christmas stocking. (They might prefer a RAM pack, but Selec's offering comes a lot cheaper.) 'Maze Guzzler' is a game after the 'Pac-man' style, and all the usual facilities found on the 16K games are available. The restricted memory has dictated a small screen display, but it is nevertheless a very good game.

On the B-side of Selec's cassette is a game called 'Super-breakout'. This is a good 1K version, again with a less than full-size screen display. All Selec's 1K games cassettes are of a very high standard, although they have perhaps arrived a little late on the software market to achieve much penetration . . . which is a shame.

Another excellent version of Breakout is New Generation Software's Gamestape 6' (formerly JK Greye's Gamestape 6). This uses a full screen display and is a first class game, and good value for money too! However, since it was produced well before 1983, it doesn't really qualify for too much of a mention here.

Go FORTH

So much for games. For the ZX81 programmer who feels like a change from BASIC, how about taking a closer look at Artic's FORTH package. Originally selling for around £30, this implementation now sells for £14.95 and should keep you more than busy over the Christmas holiday.

The manual which comes with the cassette is not really intended for the complete novice, so if you're new to FORTH you will probably need a book on the subject to help you through the teething stages.

I did not find this FORTH package particularly easy to use – not, I hasten to add, a fault of Artic's – because of the slow ZX81 cassette system. The FORTH compiler takes about six minutes to load, and the four screen editors take a further 20 or so seconds each. Apart from the initial wait to get the FORTH loaded, if you should crash the system half-way through a programming session, you will have a frustrating wait while you reload the compiler/editor and start all over again.

Various versions of FORTH have been developed, but this version is an implementation of Fig FORTH. Artic supply a 'peel-off' keyboard overlay which is intended to be stuck on the ZX81 keyboard. The keys are similar to those normally found on the keyboard with a few exceptions such as the FORTH words '@' and '!' on the 'W' and 'Q' keys. It doesn't have to be used – I didn't use it as I have a File-Sixty keyboard with moving keys – but it does help you get used to the package.

FORTH is considerably faster to run than BASIC, and its power lies in the ability to allow you to define your own words (or functions). FORTH already has an extensive range of words and the programmer can use these to create additional words to do whatever is required. Once a new word has been defined, it becomes part of FORTH's vocabulary.

The compiler takes up something like 9K of RAM, and what with the screen editors this only leaves about 2K left for the user to work within. However, as I mentioned before, FORTH is a very economical language and you can achieve a lot within this confine.

ZX FORTH is a first class implementation of this language and provides a good insight into its peculiarities. If it bites you, it should be easy to progress onto a dedicated FORTH machine or another FORTH system as Artic have kept very closely to the standard language.

Xmas adventures

Apart from the software mentioned here, I've got plenty to keep me out of mischief over Christmas. I have still yet to complete all of Artic's adventures – Espionage Island alone should keep me from overdoing the food and drink – and I shall need a clear head to brush up on my flying using Psion's 'Flight Simulation'.

On a last note, happy Christmas to all ZX Computing readers, and good computing!

Nick Pearce.

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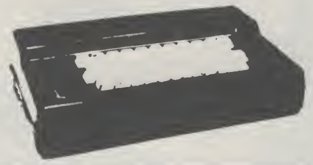

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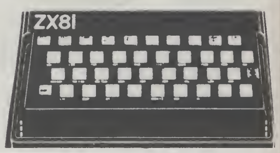
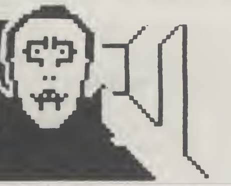


THE TOMB OF DRACULA!



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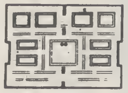

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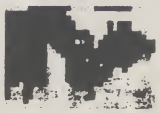
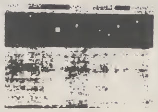
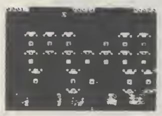
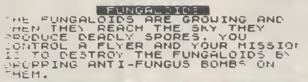




GUNFIGHT (machine code)

INVADERS (machine code)





```
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WHEN THEY REACH THE SKY THEY
PRODUCE DEADLY SPORES. YOU
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IS TO DESTROY THE FUNGALOIDS BY
DROPPING ANTI-FUNGUS BOMBS ON
THEM.
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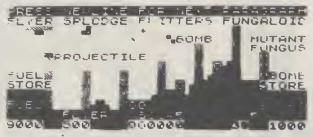

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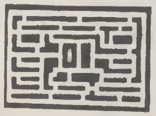

SPACE RESCUE (machine code)
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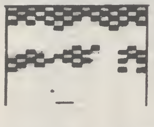
BREAKOUT (machine code)



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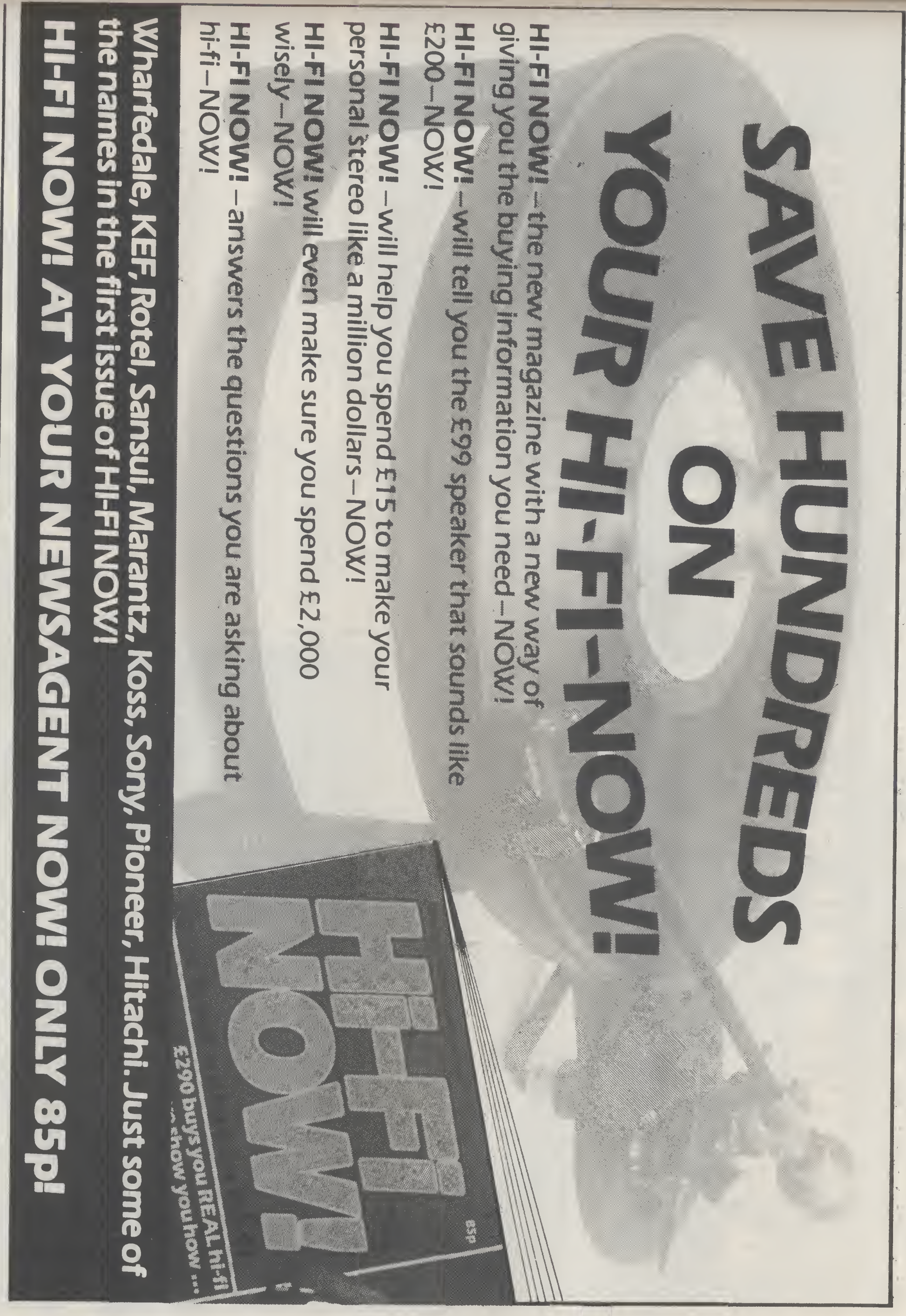

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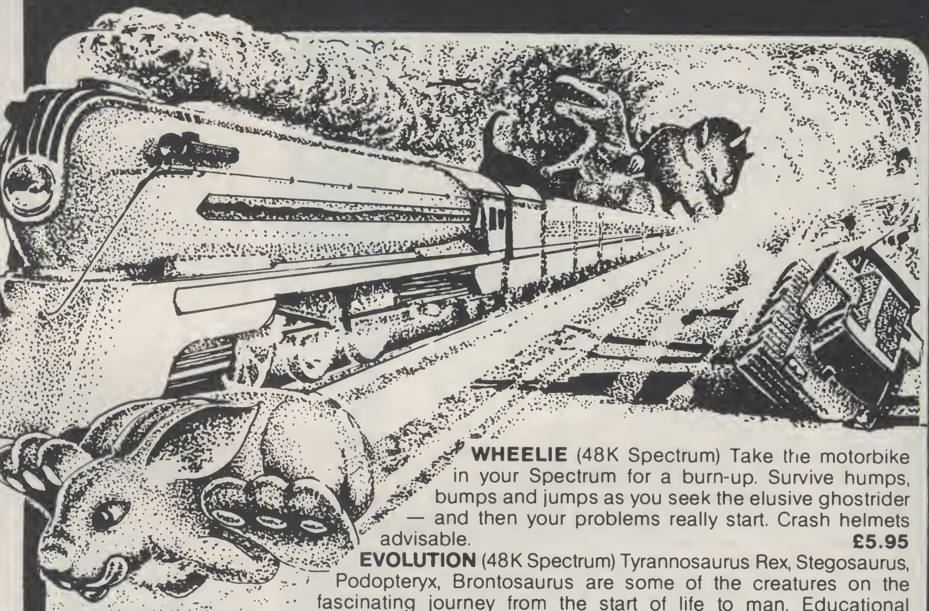

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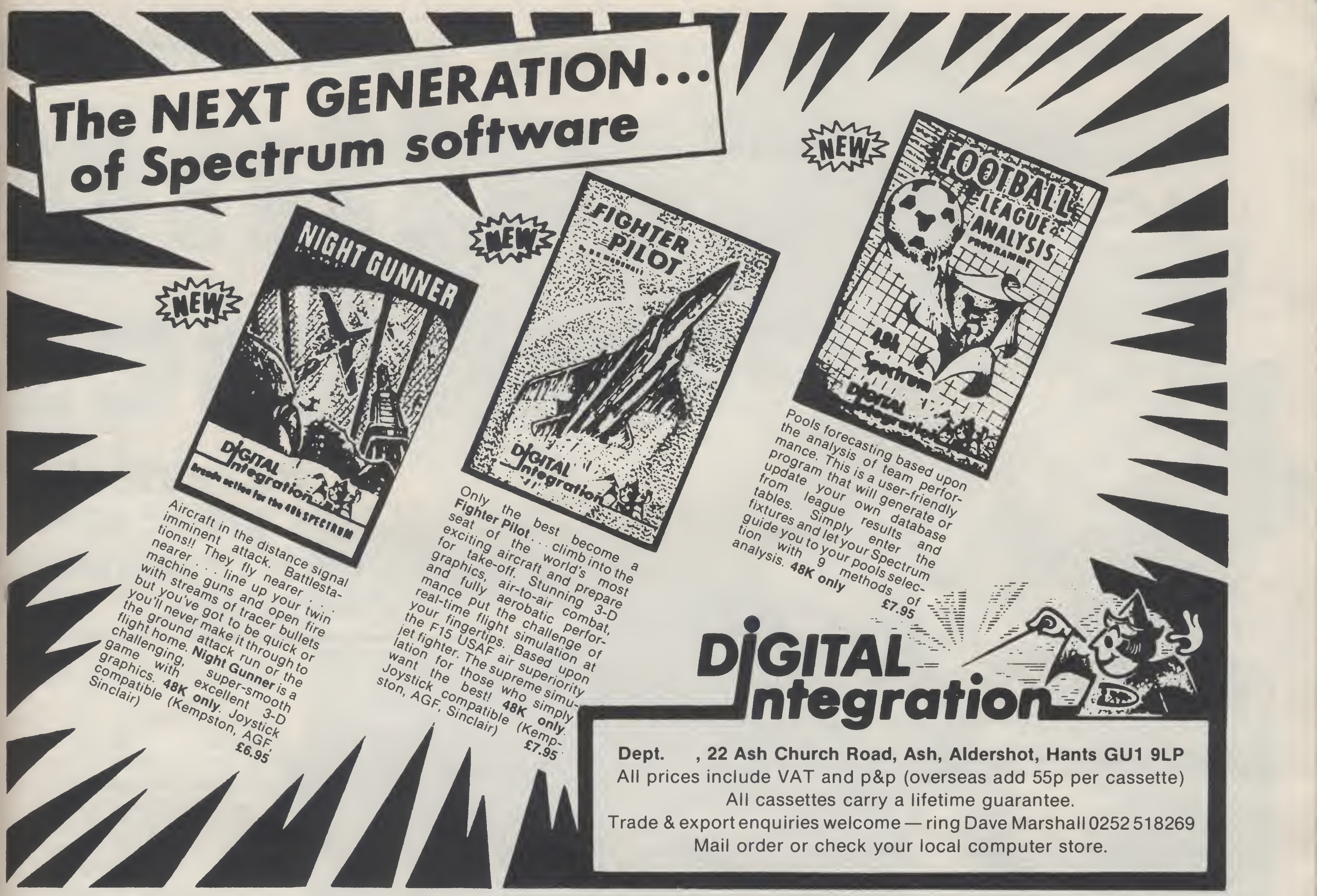

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Coding graphics

Increase your character size with this great utility written for us by P Greenwood of Sevenoaks.

The purpose of the program is to enable screen displays of large characters or user-defined graphics to be created quickly and easily by calling the character or graphic from a library of symbols stored in an array. On program termination, the screen display is saved in high memory, and is then available for inclusion in a new program.

The program is entertaining to use, and some interesting effects can be achieved by mixing both normal and inverse characters on the screen. The symbol library can hold 54 characters, each designed on a three by five matrix, and as an aid, I enclose a list showing the numeric data required to create 54 possible characters. The program may be used with an incomplete library, any new characters being added as and when required, with the option to redefine any previously created character.

How the program works

Lines 20 to 240 are concerned with creating a graphic character, and storing the associated data in an array. The array subscript C is calculated by the subroutine at line 640, after which a check is made at line 100 to see if the character has already been defined. When character definition is completed, press Newline to enter the PLOT routine, which works as follows.

Lines 260 and 270 set the initial printing position for the first character to be plotted. Line 290 requests a character, the subroutine at line 640 converting C$ into the appropriate location C in the array. The individual bytes stored in this string location are then POKEd into the first 15 locations of the line 1 REM statement. This operation is carried out by lines 330 to 390.

Line 410 copies the screen display to above RAMtop. Line 420 puts the chosen character at the initial print position. Lines 430 to 470 scan the keyboard for an input, with any X-Y moves incrementing or decrementing the values held in addresses 16542 and 16544. Line 500 copies the screen display back from above RAMtop, a jump then being made to line 420 where the chosen character is reprinted. Line 470 permits an escape from this loop, enabling the chosen character to be incorporated into the screen display when line 410 is next executed.

When character plotting is completed, pressing Newline enters the invert routine, executed by line 560. Line 570 stores the screen display above RAMtop. The final option is to finish the program by typing Y, or Newline to re-enter the plotting routine.

Creating the program

Reserve some memory for the machine code routines by typing the following direct commands:

```
POKE 16388,0
POKE 16389,125
NEW
```

This sets RAMtop to 32000. Type in the Hex loader program, Fig. 1, ensuring that line 1 contains at least 109 characters. Enter the Hex code as shown in the left-hand column of Fig. 2, terminating each line of code with Newline. If a mistake is made in typing, pressing Newline will select 'edit' mode, indicated by an inverse 'E' being displayed. Now type the correct code and continue, or re-edit as required. Terminate data entry by typing ZZ. Delete all lines except line 1, then press Clear.

As a direct command, type DIM A$(54,5,3) to create an array of 54 characters. Note that this direct command avoids the use of a line number in the program, and so careless use of GOTO cannot acciden-

tally re-DIMension the array and destroy previously entered data. RUN will also destroy data, and so the program should always be restarted using GOTO 1. Add the BASIC lines such that the program is now as shown in Fig. 3. Type GOTO 1 and use Fig. 4 to create the characters required, entering a number followed by Newline for each of the 15 entries per character. The character is built up and displayed as each entry is made. When data entry is completed, opt out of this routine by pressing Newline. Step through the options by successful presses of Newline, typing 'Y' in response to 'EXIT PROGRAM?'. To save the program on tape, start the cassette recording, then type GOTO 620.

Using the program

Ensure that RAMtop is set to 32000. The program will start automatically when loaded, but if a re-start is required, type GOTO 1. In response to 'CREATE WHICH CHARACTER?' press Newline. The next reply will produce the chosen character in the lower left-hand corner of the screen. Steer the character into place and fix using the keys as prompted.

The next character selected will be initially superimposed on the previous one, and may be manipulated as before. You can opt out of this routine by pressing Newline. For inverse graphics press 'Y' in response to the prompt. A 'Y' response to the next prompt will terminate the program. A screen dump, Fig. 5, shows typical characters. The display has now been saved in high memory. To call this display into a new program press New, then enter the BASIC shown in Fig. 6. Run this program, and when the report code 0/60 appears, each program line may be deleted. The graphics may now be displayed, either by a direct command PRINT Z$ or as a program line, eg 10 PRINT Z$ followed by GOTO 10.

A load of code

The machine code routines have starting addresses as follows:

16529 C.UP
16541 PRINT
16591 C.DN
16604 INVRT

The routines C.UP and C.DN use the LDIR instruction to block-move 727 bytes of code from the address of the display file to address 32000 and *vice versa*. The Print routine works as follows. The B and A registers hold the X and Y printing offsets with respect to screen 0,0. Steps 19 and 20 increment the display file address by an amount equal to the value in register B. Steps 25 and 26 then increment the display file address by an amount equal to 33 times the value in register A.

Having established the printing position, steps 31 to 34 print the first three bytes of the enlarged character. Steps 35 to 37 then increment the display file address by 30 to point to the corresponding printing position on the next line, and the next three bytes are then printed here. This process is repeated five times to print the complete character, at which time the C register, previously loaded with five at step 27, has been incremented to zero and a return to BASIC is made.

The INVRT routine finds each printing character in the display file, adds 128 to the current value, then overwrites the old value.

Fig.1. The Hex loader program.

```
   1 REM ...........1.........2...
......3..........4.........5.....
...6...........7..........8.......
..9..........0..........
  10 LET X=16514
  20 INPUT A$
  30 IF A$="" OR INT (LEN A$/2)<
>LEN A$/2 THEN GOTO 20
  40 PRINT AT 21,0;"          ";A
T 21,1;A$
  50 INPUT Z$
  60 IF INT (LEN Z$/2)<>LEN Z$/2
 THEN GOTO 50
  70 IF Z$<>"" THEN GOTO 100
  80 PRINT AT 21,0;"▒"
  90 GOTO 20
 100 SCROLL
 110 POKE X,16*CODE A$+CODE A$(2
)-476
 120 LET X=X+1
 130 LET A$=A$(3 TO )
 140 IF A$<>"" THEN GOTO 110
 150 IF Z$="ZZ" THEN STOP
 160 LET A$=Z$
 170 GOTO 40
```

Fig.2. The Hex code — load each line of code from the left-hand column and then press Newline.

```
000000                         1
000000                         2
000000                         3
000000                         4
000000                         5
2A0C40   LD HL,(16396)         6   C.UP
11007D   LD DE,32000           7
01D702   LD BC,727             8
```

▶

```
EDB0      LDIR              9
C9        RET               10
0600      LD B,0            11  PRINT
3E00      LD A,0            12
F5        PUSH AF           13
112100    LD DE,33          14
2A0C40    LD HL,(16396)     15
78        LD A,B            16
FE00      CP 0              17
2803      JRZ,+3            18
23        INC HL            19
10FD      DJNZ,-3           20
F1        POP AF            21
FE00      CP 0              22
2804      JRZ,+4            23
47        LD B,A            24
19        ADD HL,DE         25
10FD      DJNZ,-3           26
0E05      LD C,5            27
118140    LD DE,16513       28
0603      LD B,3            29
13        INC DE            30
23        INC HL            31
1A        LD A,(DE)         32
77        LD(HL),A          33
10FA      DJNZ,-6           34
061E      LD B,30           35
23        INC HL            36
10FD      DJNZ,-3           37
0D        DEC C             38
20F0      JRNZ,-16          39
C9        RET               40
21007D    LD HL,32000       41  C.DN
ED5B0C40  LD DE,(16396)     42
01D702    LD BC,727         43
EDB0      LDIR              44
C9        RET               45
2A0C40    LD HL,(16396)     46  INVRT
0615      LD B,21           47
0E20      LD C,32           48
23        INC HL            49
7E        LD A,(HL)         50
C680      ADD A,128         51
77        LD(HL),A          52
0D        DEC C             53
20F8      JRNZ,-8           54
23        INC HL            55
10F3      DJNZ,-13          56
C9        RET               57
```

Fig.3. The main part of the BASIC program.

```
   1 REM                 E£RND) ?
▀NOT ▀ GOSUB █TAN ▄▀ Y( PRINT )5
E£RND? RETURN  C▀7( CLEAR LET RE
TURN  C▄ ?;( CLEAR :█)▄RND▄▀▀(7,?(
 IF ▄▀27( CLEAR $4 LIST TAN 5 ? G
OSUB ?£RND▀NOT  ▀ GOSUB █TAN E£RN
D▄▀+:47 SAVE 7( NEXT TAN
  20 REM ------ ARRAY A$(54,5,3)
             HAS BEEN DIMENSIONED
  30 REM ---------------- CREATE
  40 PRINT AT 21,0;"CREATE WHICH
 CHARACTER?              "
  50 INPUT C$
  60 IF LEN C$>1 THEN GOTO 50
  70 CLS
  80 IF C$="" THEN GOTO 250
  90 GOSUB 640
 100 IF CODE A$(C,1)+CODE A$(C,2
)+CODE A$(C,3)+CODE A$(C,4)+CODE
 A$(C,5)=0 THEN GOTO 140
 110 PRINT AT 21,0;"CHARACTER EX
ISTS, RE-DEFINE? (Y)"
 120 INPUT B$
 130 IF B$<>"Y" THEN GOTO 40
 140 CLS
 150 FOR M=1 TO 5
 160 PRINT """";C$;"""";" LINE "
;M;" DATA?    ";
 170 FOR N=1 TO 3
 180 INPUT D
 190 LET A$(C,M,N)=CHR$ D
 200 PRINT A$(C,M,N);
 210 NEXT N
 220 PRINT
 230 NEXT M
 240 GOTO 40
 250 REM ------------------ PLOT
 260 LET X=0
 270 LET Y=16
 280 PRINT AT 21,0;"PLOT WHICH C
HARACTER?  "
 290 INPUT C$
 300 IF C$="" THEN GOTO 520
 310 PRINT AT 21,0;"SEARCHING FO
R CHARACTER"
 320 GOSUB 640
 330 LET Z=16514
 340 FOR M=1 TO 5
 350 FOR N=1 TO 3
 360 POKE Z,CODE A$(C,M,N)
 370 LET Z=Z+1
 380 NEXT N
 390 NEXT M
 400 PRINT AT 21,0;"MOVE 5,6,7,8
, CONFIRM C"
 410 RAND USR 16529
 420 RAND USR 16541
 430 IF INKEY$="5" AND X>0 THEN
LET X=X-1
 440 IF INKEY$="8" AND X<29 THEN
 LET X=X+1
 450 IF INKEY$="7" AND Y>0 THEN
LET Y=Y-1
 460 IF INKEY$="6" AND Y<16 THEN
 LET Y=Y+1
 470 IF INKEY$="C" THEN GOTO 280
 480 POKE 16542,X
 490 POKE 16544,Y
 500 RAND USR 16591
 510 GOTO 420
 520 REM ---------------- INVERT
 530 PRINT AT 21,0;"INVERSE VIDE
O? (Y)   "
 540 INPUT C$
 550 IF C$<>"Y" THEN GOTO 570
 560 RAND USR 16604
 570 RAND USR 16529
 580 PRINT AT 21,0;"EXIT PROGRAM
? (Y) "
 590 INPUT C$
 600 IF C$<>"Y" THEN GOTO 280
 610 STOP
 620 SAVE "█"
 630 GOTO 30
 640 LET C=CODE C$-10
 650 IF C=182 THEN LET C=1
 660 IF C=-10 THEN LET C=54
 670 RETURN
```

Fig.4. Type in each of the 15 entries you'll need to create each character, followed by Newline.

```
" "   0     0     0     0     0     0     0
0     0     0     0     0     0     0     0

""""  5     5     0     0     0     0     0
0     0     0     0     0     0     0     0

"£"   135   3     4     129   4     0     129
4     0     133   0     0     2     3     1

"$"   135   130   0     5     5     1     2
7     1     134   130   1     0     1     0

":"   0     0     0     0     0     0     1
0     0     0     .0    0     1     0     0

"?"   6     3     4     1     0     5     0
7     0     0     1     0     0     1     0

"("   135   1     0     5     0     0     5
0     0     134   0     0     0     1     0

")"   134   0     0     0     5     0     0
5     0     135   1     0     1     0     0

">"   0     0     0     134   0     0     135
```

```
1      0      1      0      0      0      0      0
"<"    0      0      0      135    1      0      134
0      0      0      1      0      0      0      0
"="    0      0      0      131    131    4      131
131    4      0      0      0      0      0      0
"+"    0      0      0      0      5      0      3
7      1      0      1      0      0      0      0
"-"    0      0      0      0      0      0      3
3      1      0      0      0      0      0      0
"*"    0      4      0      134    130    1      132
126    1      1      5      1      0      0      0
"/"    0      0      5      0      133    0      135
1      0      6      0      0      1      0      0
";"    0      0      0      0      0      0      2
0      0      0      0      0      6      0      0
","    0      0      0      0      0      0      0
0      0      0      0      0      5      0      0
"."    0      0      0      0      0      0      0
0      0      0      0      0      1      0      0
"0"    6      3      4      5      135    5      130
1      5      5      0      5      2      3      0
"1"    132    0      0      133    0      0      133
0      0      133    0      0      3      1      0
"2"    6      3      4      0      135    1      135
1      0      5      0      0      3      3      1
"3"    3      3      5      0      5      0      2
3      4      4      0      5      2      3      0
"4"    0      5      0      5      0      0      5
133    0      3      132    1      0      2      0
"5"    6      3      0      5      0      0      3
3      4      4      0      5      2      3      0
"6"    6      3      4      5      0      0      7
3      4      5      0      5      2      3      0
"7"    3      3      5      0      135    1      135
1      0      133    0      0      2      0      0
"8"    6      3      4      5      0      5      6
3      4      5      0      5      2      3      0
"9"    6      3      4      5      0      5      2
3      5      4      0      5      2      3      0
"A"    6      3      4      5      0      5      7
3      5      5      0      5      1      0      1
"B"    7      3      4      5      0      5      7
3      4      5      0      5      3      3      0
"C"    6      3      4      5      0      0      5
0      0      5      0      4      2      3      0
"D"    7      3      4      5      0      5      5
0      5      5      0      5      3      3      0
"E"    7      3      1      5      0      0      7
3      1      5      0      0      3      3      1
"F"    7      3      1      5      0      0      7
3      1      5      0      0      1      0      0
"G"    6      3      4      5      0      0      5
2      5      5      0      5      2      3      0
"H"    5      0      5      5      0      5      7
3      5      5      0      5      1      0      1
"I"    132    1      0      133    0      0      133
0      0      133    0      0      3      1      0
```

```
"J"    0      0      5      0      0      5      0
0      5      5      0      5      2      3      0
"K"    5      0      5      5      6      0      7
4      0      5      2      4      1      0      1
"L"    5      0      0      5      0      0      5
0      0      5      0      0      3      3      1
"M"    7      6      5      5      5      5      5
0      5      5      0      5      1      0      1
"N"    5      0      5      7      4      5      5
2      5      5      0      5      1      0      1
"O"    6      3      4      5      0      5      5
0      5      5      0      5      2      3      0
"P"    7      3      4      5      0      5      7
3      0      5      0      0      1      0      0
"Q"    6      3      4      5      0      5      5
0      5      5      134    1      2      1      1
"R"    7      3      4      5      0      5      7
7      0      5      2      4      1      0      1
"S"    6      3      4      5      0      0      2
3      4      4      0      5      2      3      0
"T"    3      7      1      0      5      0      0
5      0      0      5      0      0      1      0
"U"    5      0      5      5      0      5      5
0      5      5      0      5      2      3      0
"V"    5      0      5      5      0      5      5
0      5      134    135    1      0      1      0
"W"    5      0      5      5      0      5      5
4      5      5      5      5      3      2      1
"X"    5      0      5      2      6      0      0
5      0      6      2      4      1      0      1
"Y"    5      0      5      134    135    1      0
5      0      0      5      0      0      1      0
"Z"    3      3      5      0      135    1      135
1      0      5      0      0      3      3      1
```

Fig.5. A screen dump showing typical characters designed using this program.

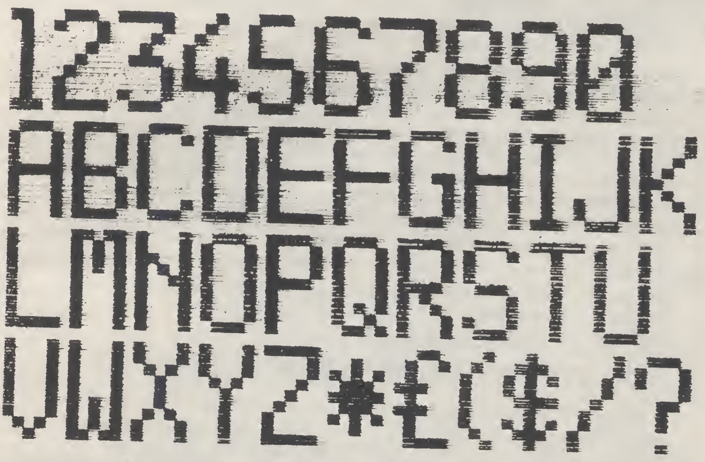

Fig.6. The BASIC program required to call this display into a new program.

```
   10 FAST
   20 LET Z$=""
   30 FOR X=32000 TO 32692
   40 IF PEEK X<>118 THEN LET Z$=
Z$+CHR$ PEEK X
   50 NEXT X
   60 SLOW
```

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3D Monster Maze
New Generation Software
John Hall

After a four minute loading time, the program auto-ran and the message 'Anyone there?' flashed onto the screen. After a while, it said 'Well, press something then'. I pressed a key and a man appeared on the left of the sreen and 'Roll up, roll up, see the amazing Tyrannosaures Rex...' scrolled up on the screen, along with instructions, if you require them.

Next the message 'the mists of time passed over' comes up, and after another 30 seconds, the maze appears on the screen...in 3D! "Simple" I thought, until I saw the message 'Footsteps approaching' and I spotted a T Rex marching towards me. It was not long before I was posthumously awarded 35 points. And there I was back in the maze.

I was very surprised by the graphics — they are excellent! All the walls facing you are shown as grey, whereas the wall at an angle to you are coloured black — providing an extremely good 3D simulation. And the T Rex! Every step further towards you reveals more detail of the monster until only its teeth can be seen as you are being 'eaten alive'.

As you travel down corridors, you see more passages to your left and right, any of which you can choose to go down. The graphics of the maze alone are great, without the added bonus of the T Rex and the exit.

Ah. Did I mention the exit? Yes, somewhere in the maze is an exit, but the maze is very complex and the exit is extremley difficult to find. And the exit is sited in a different place each time you play the game so it's no use trying to remember a formerly successful route. When the exit is found, it is easily recognisable by the rings of random characters moving outwards from the centre. Quite spectacular really!

If you are told to 'RUN' at any time during the program, then it is advisable to do so as it is possible to outrun the T Rex. You can alter the speed of the game easily, but be warned, it gets very difficult to play the game at the higher speeds.

When you see the words 'Rex lies in wait' printed up on the screen, you must be very cautious. This means that the T Rex could literally be 'just round the corner'.

This is definately not a game for those of a nervous disposition. But for anyone else, it is an entertaining (and highly recommended) machine code game, which at £4.95, is good value for money and 'the game to top all the others'.

Astro Blaster
Quicksilva
Mark Stoneman

Quicksilva have a reputation for good quality, reasonably priced, original games with excellent graphics and sound. Their offerings, therefore, can expect harsh criticism for minor grievences.

It now seems the 'in thing' in Spectrum programming to be able to fit a good game into 16K, what with Melbourne House/Psion managing to get the three excellent Horace games into 16K. Quicksilva have obviously tried to copy their competitors' achievements but in doing so they have made several crucial errors: it would have been better if they had left it in 48K!

The game loads very quickly (in only 43 seconds) and having done so the player is then given the option of using the Kempston joystick or the keyboard. Once you have selected your means of doing battle you are shown the keyboard controls, regardless of the weapon chosen. They are: 'S' to start the game itself; '6' to move your ship left; '7' to move your ship right; '0' to fire and 'H' to hold the game at any point. This is a very useful command as your trigger finger can get very tired during this very fast, non-stop arcade game. Incidentally, the standard set of alphabet characters is not used but a 'Space-Age' set which is rather novel.

The scene is set by an exerpt from 'The Book Of The Faluvian Empire', on which the game is based. Once the start button is pressed you are thrown straight into the thick of the action. You are the cyan-coloured ship at the bottom of the screen but instead of the enemy being above you, as is tradition, they are in front of you.

When you see the screen for the first time you witness the major disappointment for the first time. The game is set on a background of stars but instead of them scrolling from top to bottom they appear at random, which spoils the effect considerably. You commence with five ships and the first obstacle is a screen of Cybirds which flap all over the screen at random dropping Plasma Bolts, and are able to scroll from one side of the screen to the other (ie left to right, or vice-versa) although you cannot.

Having destroyed one screen of Cybirds you find yourself approaching a repeat of the previous screen. This completed you are thrown into the middle of a meteor storm. These red lumps of rock shuffle around randomly can cut into your ship at the last moment, destroying it if you're not careful.

Should you manage to survive the storm you are confined by a swirling 'egg-like' object which delivers Plasma-bolts at a great rate of knots: you are well advised to stay clear of this until it 'hatches'. Once this happens another screen of aliens appears, although they are very different to the Cybirds and resemble the traditional invader much more. Their Plasma-Bolts sway from side-to-side as they approach and, like the Meteors, cut into you at the last minute. Then comes a repeat of the previous and then the Meteors. Should you manage to survive all this, a screen of Insect-like aliens awaits you. Their Plasma-Bolts approach in the same way to those just encountered. Altogether there are five stages and 15 levels of difficulty. However, there are several bad points which should be noted:

1) The fact that stars appear at random rather than scroll from top to bottom, as I have already said.
2) Every time you beat a set of aliens you have to survive a Meteor Storm, which gets a bit tedious after a while. Your success in the game largely depends on how you fare in the storms.
3) There is a Hall of Fame but to enter your initials into it you have to use the left, right and fire buttons. You can use the start button to skip it but the best score is only registered through the Hall of Fame.

The score, best score and ships left are all shown on screen as well as the title and the name of the author: John Edwards. The game, like all Quicksilva ones, is fabulously boxed and, priced at £4.95, is very reasonable indeed.

Although the game is basically an updated Space Invader, Quicksilva have tried to introduce some of their own ideas. It might be an idea to modify the above problems and make a 48K version.

Astroblaster is available from Quicksilva Ltd, 13 Palmerston Road, Southampton SO1 1LL and is both entertaining and challenging; I would say it is one of the best arcade games for the 16K Spectrum.

Spectrum Masterchess
Mikro Gen
Darren Sargent

If you like playing chess, then this is the casette for you. If you *don't* like waiting for them, however, then perhaps you should think twice before ordering. This cassette took three weeks and several calls to Mikro-Gen before it plopped on my doormat.

It is unusual not to find the LOADing instructions on the insert card, instead it tells you to 'LOAD in the usual way'. Once you have accomplished this feat (no offence, Mikro Gen, it loaded first time), you are presented with an elegant graphic chess board, complete with pieces and alpha-numeric labelling. At the top left of the screen are two mysterious words, 'You' and 'Me'. These turn out to be the column heading for the scrolling history of moves.

At the bottom of the screen are the options: play/colour/set-up. Taking these in order:

Play: Pressing 'p' puts you into 'play' mode. You are asked if you would like to play black or white, and then for the level ('O'-easy, to '9'-probably hard when it *eventually* moves). If you decide to play black the computer will kindly reverse the board for you, so that you are always playing up the screen. Once you have done all this, presuming you are playing white you can: key in your opening move; delete the move you were about to key in; change the level; ask for a recommended move; get a screen dump; save the game; or go back to the play/colour/set up question. After each move you are offered this series of options.

Colour: This allows you to get the board, background, text colours, and what type of pieces are used in the display.

Set-up: This allows you to set up chess postions and then play them. You move a cursor over the board, with which you can place any piece of either side at any position on the board. When you have set up your position, you can choose sides, level and black or white to play.

This cassette is excellent value for any chess enthusiast, although the instructions say nothing about the rules of chess. Even so, it supports all the usual chess moves (castling, etc) and is a worthwhile purchase at £6.95.

Black Crystal
Carnell Software
MJ Richards

Although it took four weeks for the Black Crystal adventure program from Carnell to arrive, it was very impressively packaged on two tapes with a large pamplet which reported the history of The Black Crystal and listed the control keys.

The game was in six parts which all loaded in the first time, although there was a back-up copy. The quality of the tape was good and there was very little hiss. I decided to be a wizard the first time I played the adventure.

The graphic display at least on the first map was very jerky. In several parts, particularly maps three and four, the program is mainly text; however, graphics play a large part in the game. The main drawback is the speed of the graphical display which could be improved using machines code or Pascal. The keyboard reacts quickly, which is important, for the battles are in real time.

Your aim is to collect seven rings of power which are hidden in the six maps. The difficulties in the maps aride from monsters, either controlled by the Lords Chaos or ones independant but just as mean. The game is by no means easy. The greatest difficulty arises from maps one, two, five and six which are most grahical; maps three and four are less graphical but by no means easy.

Despite the same plot being used in different games, the sheer quantity always means there is always something to see. In map four the king reacts very amusingly when he orders your death but, because you are resurected by Gora now a semi-God, he captures you again. Also, the abacus which you can pick up can never get the right answer. The game is addictive because you often have to spend more than one day on one game. I have now played several games all most enjoyable. My favourite is map six which is the shortest but still challenging, particularly the second level game of logic. Because there is 180K of program in this package there is a great deal of variety.

Graphics feature largely in the game and use of the user-defined graphics is very good. However, a keyboard overlay would be useful as more than 16 keys are used in some parts excluding those which required two word commands. Map one has a very impressive graphic display.

At £7.50 it is a very good buy as it includes an incredible amount of detail and it is very good quality. It is highly recommendable.

Airline
Cases Computer Simulations
J. Whittaker

The main objective of this game is to increase your net assets of £3 million to £30 million. It may sound easy but is it not, because you only have seven years in which to do it.

The game begins with an urgent telex telling you that the Civil Aviation Authority has granted you a £1 million trans-Atlantic licence to fly DC10s from Gatwick. Then you are given a bar chart estimating payloads for these DC10s. Then comes a line graph of charter rates for each quarter of the year. You must then decide on how many DC10s you wish to charter; this is done from the previous pieces of information. Then, another decision must be made on levels of crew and maintenance. You must then key in the amount of insurance cover you need. This is usually followed by a disaster namely a highjack, a crash or sabotage, this is why it is usually best to have full insurance cover.

As well as these things happening you can also decide on whether or not to sign a fuel contract with Saudi Arabians. But occasionally this is unwise. Sometimes the Americans prove unfriendly claiming that you are not paying suffienct taxes.

At the end of each year you are shown a profit and loss account and then a balance sheet. Then comes a Financial Times report which tells you how well you did or didn't. A way of getting a very good Financial Times report is an investment in the form of buying a DC10 but this is only achieved when your airline is doing well. If you get a really terrible report the recievers close in and liquidate L-Air.

This is an excellent game which really tests your business skills and initiative, but if you buy this expecting very good graphics or and addictive game like 'Space Raiders' you will be very disappointed.

Airline retails at £6.95.

Orbiter
Silversoft
Lawrence Tout

I have been receiving *ZX Computing* for about a year now, but am amazed to have never seen Silversoft's Orbiter reviewed. So, now I have a chance to tell the readers what a fantastic program it is!

It's nearly exactly like the arcade game 'Defender'. You have to travel in your ship, across the hilly landscape, blasting any green aliens you come across. The aim of the game is to retain 10 blue objects which lie along the bottom of the screen amongst the landscape. You are given these at the start of each game and the green aliens try to attach themselves to these and move towards the top of the screen. The aim is to first blast the alien and then catch the falling blue object before it hits the ground and is destroyed. Points are given for catching it and returning it to the ground safely. However, if you don't stop the alien and it reaches the top of the screen, it changes into a purple coloued alien. Its movement is much more eratic and they move faster making them difficult to hit.

The layout of the keys is cleverly done and they include: up, down, thrust, fire, change direction, hyperspace and smart bombs. If used, the smart bombs destroy everything on the screen with an impressive flash.

Besides the resident aliens there are also, blue and purple squares which move diagonally across the screen laying mines, as well as innocuous looking yellow saucers which never move except when they are hit, when a hoard of smaller red saucers are unleashed.

The entire activities of all the aliens are shown on a long-range scanner at the top of the screen.

As you progress through one attack-wave after another, you are awarded extra ships and smart bombs. I've found that after 200,000 points the computer becomes very generous with these.

One drawback with Orbiter is that you are only shown a maximum of three ships and three smart bombs on the screen, so if you have more than three it is impossible to tell how many more. One time, out of curiosity, I let my ships be destroyed and found that I had 18 ships apart from those three shown (this was at about 350,000 points).

The danger in this addictive game is that if the green aliens swipe all your blue objects there is a flash, the landscape disappears and from then on all the aliens are automatically changed into mean purple ones. The secret to survival is not to, at any cost, let this happen, because if it does you're in trouble. So when down to the last blue object, instead of setting it down on the ground after taking it from the alien, hold onto it — for long as you do, no aliens can pick it up. Then you try to reach attack-wave 10, where you are given five free blue objects after every attack-wave.

At £5.95 I think Orbiter is well worth the money.

Computer Scrabble

Psion

David Rowley

About ten years ago I seriously considered writing a program to play Scrabble on PDP-8. However, I soon realized that the program's vocabulary would be so small that it would probably end up passing on half its turns. Now, Psion have produced a program with a vocabulary of over eleven thousand words (yes 11,000) for the Spectrum 48K. But having a large vocabulary is only part of what is needed to succeed at Scrabble, you need to see where the letters can be placed and decide on your strategy — is it really a good idea to open up the triple word square for your opponent?

So, on to a description of the 'product', as the marketing managers call it. The cassette comes in a miniature version of the box the original game comes in, so it is instantly recognizable. Inside the box is a professionally produced booklet describing the game for those who are unfamiliar with it, and details of how to operate the program. Although the program contains quite a lot of instructions, these are all straight-forward and easy to understand. The first trick, of course, is to load the program and after a couple of failures on side A, side B loaded first time, as it has done ever since.

On successful loading of the program a number of questions appear:

1. Is your television colour or black and white; press C for colour or B for black and white.
2. Do you wish to reload a previously saved game; type Y for yes or N for no.
3. Number of players: press 1 to 4.
4. Name of player: type name (max. 8 letters) then ENTER.
5. Whether this player is the computer or not: type Y for yes or N for no.
6. If yes then at what level do you wish the computer to play for this player; press 1 to 4, where 4 is the hardest level.
7. Do you wish to see the computer's letter rack: press Y or N.
8. Do you want to see the computer trying its moves: press Y or N.

The first option I wanted was to see the computer playing against itself, so I opted for level three against level four, with the options of seeing the computer's letter rack, and seeing it try its moves. Immediately on the screen was the Scrabble board, with different colours representing different square values. For the player currently taking a turn, the rack of letters is displayed, although not after they are placed on the board. On the right of the screen are the current totals of all players, the letter racks of all players, the number of tiles remaining, and a list of options. This game was marred a little because the letters which came up on the racks were very difficult to score well with, eg six vowels, or a 'Q' and an 'X' at the same time. However, level 4 ended up the winner, by 284 to 254. What was fascinating was to see the computer trying its moves. The flashing cursor square darted all over the board, trying out potential words, and printing things like "extra would score 32". Still, the real test of the program was to come.

As a finalist at the British Scrabble Championships some years ago I felt quite confident. I set the program level 4, and asked the computer to keep its tiles hidden and not to visibly try out it moves. After scoring 32 on my first go I felt confident. But that confidence immediately disappeared, for the computer placed a full word and got on a triple word square to score a total of 86. The rest of the game was superb. The tiles came up well, a some good words were placed. The final scores were 358 to the computer and 332 to me. Although I caught up towards the end of the game, to be honest I never looked like winning.

So, a victory first time out for the computer. I have beaten level four since, but it is not easy. I mentioned earlier that there are a number of options available. When it is a particular player's turn these options may be chosen:

Symbol shift V diplays the letter tiles of all players.
Symbol shift S displays the values of various special value squares.
Symbol shift R allows you to rearrange your tiles in any way you wish.
Symbol shift C allows you to change any number of tiles you wish.
Symbol shift J tells the computer to re-arrange the tiles in a random fashion.
Symbol shift Q abandons the game and gives you the option of saving the game or starting a new one.

It is also possible to pass if you cannot place any letters.

All the options available in the original game are available here — even knocking the board over can be accomplished by 'accidentally' pulling out the power lead. Placing a word on the board is much easier than I though it would be. You simply move the cursor to where you want the word, type A if the word is to go across the board or D if it is to go down, and then type the word. The computer then places the word on the board, gives you your score, and the option of changing your mind if you wish to play somwhere else instead. When you finally enter the word the computer checks to see if the words formed are present in its vocabulary. If they are the game progresses, if they are not the computer asks you if you are sure about the word. If you answer yes, the computer accepts it.

I mentioned the importance of strategy in Scrabble and here it is worth noting that the different levels appear to have different strategies. Level one seems to make little effort to score its maximum possible each turn, apparently placing tiles as soon as it finds somewhere they will go, and it has a very fast response time. By contrast level four always seems to attempt to get the maximum score possible, with one or two exceptions, eg if it has a blank it will not place it unless it gets quite a good score with it, but keeps it for a later turn. Dr. Peter Turcan, who Psion acknowledge as having played a large part in the development of the program, and Psion themselves, are to be congratulated on this program. For the beginner, levels one and two introduce you to the game, while level three provides a pleasant respite from the excellent lay of level four for the more experienced player. The program also appears to play an open rather than a defensive game, which is much more fun for its opponent.

Are there any criticisms of the program? Only two, the first of which I am pretty sure can be solved only by using other hardware, like a pen and paper, or a Scrabble set. This problem arises if you wish to play against the computer and against human players at the same time. While the computer can keep its letters hidden, the other human opponent cannot.

Still, more Scrabble enthusiasts believe that two person games are much more fun anyway.

The second criticism is the price, £15.95. Maybe it reflects the box the program comes in, maybe not, but Psion are likely to lose sales to those potential customers who have only played Scrabble a few times and thus, not prepard to pay this much.

Overall, a superb program, particularly if you are a Scrabble enthusiast without a regular opponent. But how about a price cut?

The authors of any of the reviews published within this section of the magazine will receive payment equal to the amount spent on the software reviewed unless another financial arrangement has already been settled on. All contibutors should be typed, double spaced, and contain any illustration you wish to see accompanying the review. You reviews should be sent to the following address:

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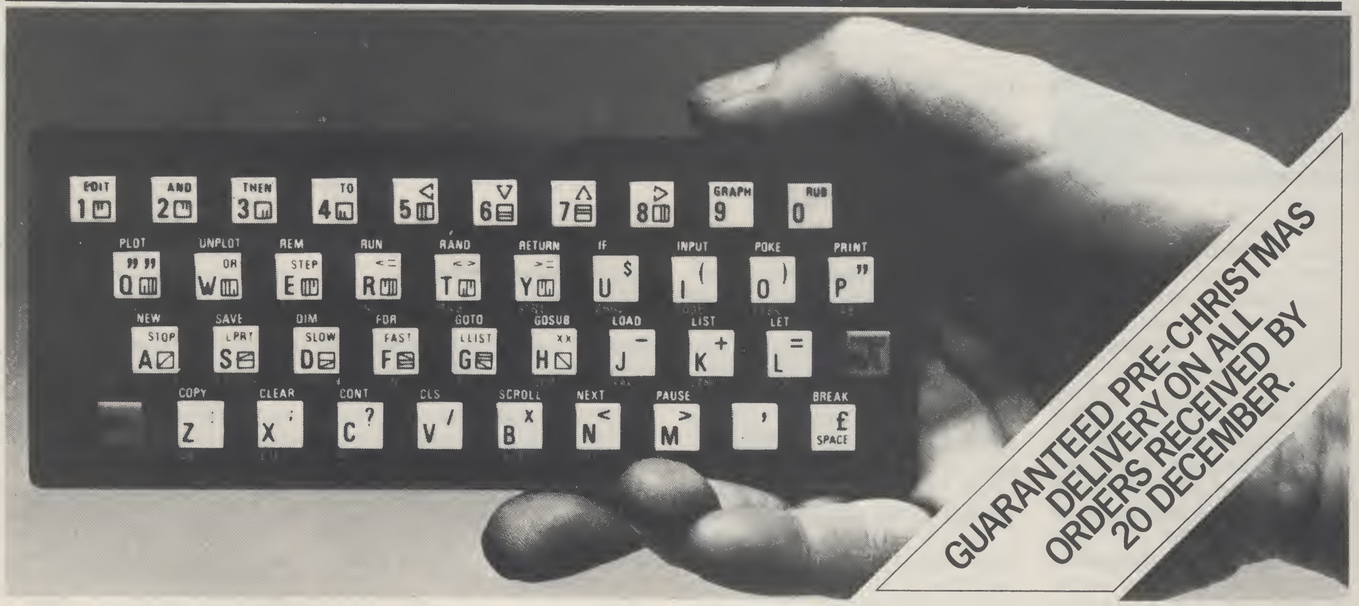
EDIT 1 AND 2 THEN 3 TO 4 5 6 7 8 GRAPH 9 RUB 0
PLOT "" Q UNPLOT OR W REM STEP E RUN <= R RAND <> T RETURN >= Y IF $ U INPUT (I POKE) O PRINT " P
NEW STOP A SAVE LPRT S DIM SLOW D FOR FAST F GOTO LLIST G GOSUB ** H LOAD - J LIST + K LET = L
COPY : Z CLEAR ; X CONT ? C CLS / V SCROLL * B NEXT < N PAUSE > M , BREAK £ SPACE

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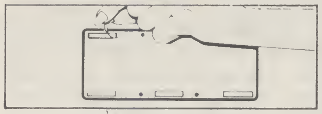
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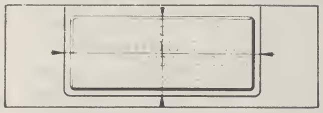
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Worms

Surround yourself in machine code in this great ZX81 program from Gary Nugent of Churchtown, Dublin.

This is a two player game, the object being to force your opponent to collide with a wall, your worm or your opponent's worm.

The game uses the full 24 by 32 screen, the walls being the black border around the screen. One worm is made from '+' characters, the other is made from '*' characters. The worms grow as you move around the screen.

Movement is in four directions; up, down, left and right. Keys 'W' (up), 'A' (left), 'S' (right) and 'Z' (down) control the '+' worm. Keys 'O' (up), 'K' (left), 'L' (right) and '.' (down) control the '*' worm. A worm is killed if it hits a wall, hits the opponent's worm, collides with itself or moves back on itself. The game also has on-screen scoring for both players. Key 'F' returns control to BASIC and stops the program.

Down the line

Looking at the main program. The machine code is held in the line 1 REM statement containing 532 characters. There is an easy way and a hard way to create such a REM statement. The hard way is to type in the 532 characters one after another. The easy way is as follows: create the REM statement in Fig. 1, that is, a REM followed by 100 characters. Edit the line numbers to form lines 2 to 5 and then enter line 6 (a REM followed by two characters) as in Fig. 2. Next, execute the following as direct commands:

```
POKE 16510,0 (this ensures
the line cannot be edited)
POKE 16511,22
POKE 16512,2
```

A REM containing 532 characters has now been created, and the machine code program can now be entered using a hex-loader like that in Fig. 3. Incidentally, if PRINT PEEK 16511+256*PEEK 16512-2 does not give the answer 532 then you have typed in the REMs wrongly, and you should go through the above procedure again.

After you have entered the machine code program, you can check to see if you have entered it correctly, using the program in Fig. 4. When you are sure you have entered the machine code program correctly, you can now enter the BASIC control program. Save the program first by RUN 200, just in case something goes wrong.

Too fast?

To increase the speed of the game, type in the following as direct commands:

```
POKE 16912,X (Where X is a
value between zero and 255.
The lower the value, the faster
the game.)
POKE 16913,0
```

To slow the game down, type in the following:

```
POKE 16912,X (Where X lies
between zero and 255. The
greater the value the slower the
game.)
POKE 16913,Y ('1' or '2' is
usually a big enough value for
Y.)
```

If you would like to change the characters which form the worms, then to change the '+' by typing in the following:

```
POKE 16838,C
POKE 16797,C+128 (Inverse
of C.)
POKE 16870,C
POKE 16880,C
POKE 16905,C
```

where C is the code of the required character.

To change the '*' worm, type in the following:

```
POKE 16850,C
POKE 16875,C
POKE 16900,C
POKE 16910,C
POKE 16813,C+128
```

The program, as published, was originally written for a 16K ZX81, although with the addition of a little bit of machine code it will run on a machine which has 3K of RAM, ie where the display file is not automatically filled with spaces. To make the program run in 3K, the machine code should be placed in a line 2 REM statement.

```
LD HL,4022             21 22 40
LD (HL),00             36 00
LD A,00                3E 00
LD C,18                0E 18
LD B,20  NEXTLN        06 20
RST 16   NEXTCHR       D7
DJNZ NEXTCHR           10 FD
DEC C                  0D
JR NZ,NEXTLN           20 F8
RET                    C9
```

You should also insert this line in the program:

```
9 RAND USR 17053
```

The code creates a 24 by 32 display file, which is automatically set up on machines which have more than 3¼K RAM.

```
   1 REM ?USR ?,
   5 REM ZX81 WORMS
   6 REM FOR 16K ZX81
   7 REM [illegible] G. NUGENT.
  10 RAND USR 16761
  20 LET A=16514
  30 POKE A,INT (RND*26)+4
  40 POKE A+1,INT (RND*16)+4
  50 POKE A+2,INT (RND*26)+4
  60 POKE A+3,INT (RND*16)+4
  70 POKE A+4,INT (RND*4)+1
  80 POKE A+5,INT (RND*4)+1
  90 IF USR 16624 THEN GOTO 20
 100 STOP
 200 SAVE "ZX81 WORMS"
 210 PRINT AT 9,3;"DO YOU WANT I
NSTRUCTIONS ?"
 220 IF INKEY$="N" THEN GOTO 270
 230 IF INKEY$<>"Y" THEN GOTO 22
0
 235 CLS
 240 LIST 500
 250 FOR I=1 TO 300
 260 NEXT I
 270 CLS
 280 RUN
 500 REM          INSTRUCTIONS
 510 REM
 520 REM
 530 REM    THE OBJECT OF THE
 540 REM  GAME IS TO FORCE YOUR
 550 REM  OPPONENTS WORM TO
 560 REM  COLLIDE WITH ONE OF
 570 REM  THE WALLS, OR WITH
 580 REM  YOUR OR HIS OWN WORM.
 590 REM  KEYS W,A,S,Z CONTROL
 600 REM  THE "+".
 610 REM  KEYS O,K,L,. CONTROL
 620 REM  THE "*".
 630 REM  KEY F ENDS THE GAME.
 640 REM
```

Fig. 1. The BASIC control program which calls the machine code routine.

```
   1 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX

   2 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX

   3 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX

   4 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX

   5 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX

   6 REM XX
```

Fig. 2.

```
10 LET X = 16514
20 LET AS = ''''
30 IF AS = '''' THEN INPUT AS
40 IF AS = ''S'' THEN STOP
50 PRINT AS ( TO 2);'' '';
60 POKE X,16*CODE As + CODE AS(2)-476
70 LET X = X + 1
80 LET AS = AS(3 TO )
90 GOTO 30
```

Fig. 3.

```
100 FOR I = 16514 TO 17045
110 LET A = PEEK I
120 LET B = INT (A/16)
130 LET C = A-16 * B
140 PRINT TAB 6;↑''-----'';CHRS(B + 28);CHRs (C + 28)
150 NEXT I
```

Fig. 4.

```
DATA: 00 00 00 00 00 00 07 03 03
   03 03 03 03 03 03 03 03 84 76
DATA: 60 00 00 00 00 00 00 00 00
   00 05 3F 3D 24 1D 00 3C 34 37
   32 38 85 76
DATA: 60 00 00 00 00 00 00 00 00
   00 82 83 83 83 83 83 83 83 83
   83 83 81 76
DATA: 76
DATA: 76
DATA: 80 00 00 00 00 00 28 34 35
   3E 37 2E 2C 2D 39 00 2C 26 37
   3E 00 33 3A 2C 2A 33 39 76
DATA: 76
DATA: 60 00 00 00 00 00 00 00 00
   00 00 2F 3A 33 2A 00 1D 25 24
   1E FF
LD HL,(D-FILE)     BORDER  2A0C40
LD DE,0021                 112100
LD A,60                    3E80
LD BC,2017                 011720
INC HL             LOOP1   23
LD (HL),A                  77
DJNZ LOOP1                 10FC
ADD HL,DE          LOOP2   19
LD (HL),A                  77
DEC C                      0D
JR NZ,LOOP2                20F8
LD BC,1F16                 01161F
DEC HL             LOOP3   2B
LD (HL),A                  77
DJNZ LOOP3                 10FC
SBC HL,DE          LOOP4   ED52
LD (HL),A                  77
DEC C                      0D
JR NZ,LOOP4                20FA
RET                        C9
LD BC,FFFF         PAUSE   01FFFF
DEC BC             LOOP5   0B
LD A,B                     78
OR C                       B1
JR NZ,LOOP5                20FB
RET                        C9
LD HL,(D-FILE)     CLEAR   2A0C40
LD DE,0023                 112300
ADD HL,DE                  19
LD C,16                    0E16
LB B,1E            LOOP7   061E
LD (HL),00         LOOP6   3600
INC HL                     23
DJNZ LOOP6                 10FB
INC HL                     23
INC HL                     23
INC HL                     23
DEC C                      0D
JR NZ,LOOP7                20F3
RET                        C9
LD E,B             RND     58
LD D,00                    1600
PUSH DE                    D5
POP HL                     E1
ADD HL,HL                  29
ADD HL,HL                  29
ADD HL,HL                  29
ADD HL,HL                  29
ADD HL,HL                  29
ADD HL,DE                  19
LD DE,(D-FILE)             ED5B0C40
INC DE                     13
ADD HL,DE                  19
```

```
LD B,00                        0600
ADD HL,BC                      09
RET                            C9
LD BC,0021          MOVE       012100
CP 01                          FE01
JR NZ,STEP1                    2002
INC HL                         23
RET                            C9
CP 02               STEP1      FE02
JR NZ,STEP2                    2002
DEC HL                         2B
RET                            C9
CP 03               STEP2      FE03
JR NZ,STEP3                    2002
ADD HL,BC                      09
RET                            C9
SBC HL,BC           STEP3      ED42
RET                            C9
LD A,(HL)           INCSC      7E
CP 9C                          FE9C
JR NZ,STEP4                    2002
LD A,9C                        3E9C
INC A               STEP4      3C
CP A6                          FEA6
JR NZ,STEP5                    2005
LD (HL),9C                     369C
DEC HL                         2B
JR LOOP6                       18EF
LD (HL),A           STEP5      77
RET                            C9
CALL BORDER                    CDF740
LD BC,060A                     010A08
CALL PRINT-AT                  CDF508
LD HL,4066                     218840
LD A,(HL)           LOOP9      7E
CP FF                          FEFF
JR Z,STEP6                     2804
RST 16                         D7
INC HL                         23
JR LOOP9                       18F7
LD D,03             STEP6      1603
CALL PAUSE          LOOP10     CD1941
DEC D                          15
JR NZ,LOOP10                   20FA
LD BC,0004                     010400
CALL PRINT-AT                  CDF508
LD A,95                        3E95
RST 16                         D7
LD A,94                        3E94
RST 15                         D7
LD A,9C                        3E9C
RST 16                         D7
RST 16                         D7
RST 16                         D7
LD C,16                        0E16
CALL PRINT-AT                  CDF508
LD A,97                        3E97
RST 16                         D7
LD A,94                        3E94
RST 16                         D7
LD A,9C                        3E9C
RST 16                         D7
RST 16                         D7
RST 16                         D7
RET                            C9
CALL CLEAR                     CD2241
LD BC,(4062)                   ED4B8240
CALL RND                       CD3941
LD (4062),HL                   228240
LD (HL),15                     3615
LD BC,(4064)                   ED4B8440
CALL RND                       CD3941
LD (4064),HL                   226440
LD (HL),17                     3617
LD HL,(4062)        NEXTGO     2A8240
LD A,(4066)                    3A8640
CALL MOVE                      CD4E41
LD (4062),HL                   223240
LD A,(HL)                      7E
CP 80                          FE80
JP NC,SCORE1                   D28042
CP 15                          FE15
JP Z,SCORE1                    CA8042
CP 17                          FE17
```

```
JP Z,SCORE1                    CA8042
LD (HL),15                     3615
LD HL,(4064)                   2A8440
LD A,(4067)                    3A8740
CALL MOVE                      CD4E41
LD (4064),HL                   228440
LD A,(HL)                      7E
CP 80                          FE80
JP NC,SCORE2                   D28B42
CP 17                          FE17
JP Z,SCORE2                    CA8B42
CP 15                          FE15
JP Z,SCORE2                    CA8B42
LD (HL),17                     3617
LD DE,0100                     110001
PUSH DE             SEARCH     D5
CALL KSCAN                     CDBB02
LD B,H                         44
LD C,L                         4D
LD D,C                         51
INC D                          14
LD A,00                        3E00
JR Z,NOCHR                     2855
CALL FINDCHR                   CDBD07
LD A,(HL)                      7E
CP 3C                          FE3C
JR NZ,CHAR1                    2004
LD A,04                        3E04
JR DIR1                        1841
CP 34               CHAR1      FE34
JR NZ,CHAR2                    2004
LD A,04                        3E04
JR DIR2                        183E
CP 3F               CHAR2      FE3F
JR NZ,CHAR3                    2004
LD A,03                        3E03
JR DIR1                        1831
CP 1B               CHAR3      FE1B
JR NZ,CHAR4                    2004
LD A,03                        3E03
JR DIR2                        182E
CP 26               CHAR4      FE26
JR NZ,CHAR5                    2004
LD A,02                        3E02
JR DIR1                        1821
CP 30               CHAR5      FE30
JR NZ,CHAR6                    2004
LD A,02                        3E02
JR DIR2                        181E
CP 38               CHAR6      FE38
JR NZ,CHAR7                    2004
LD A,01                        3E01
JR DIR1                        1811
CP 31               CHAR7      FE31
JR NZ,CHAR8                    2004
LD A,01                        3E01
JR DIR                         180E
CP 28               CHAR8      FE28
JR NZ,NOCHR                    200D
LD BC,0000                     010000
JR NOCHR                       1808
LD (4066),A         DIR1       328640
JR NOCHR                       1803
LD (4067),A         DIR2       328740
POP DE              NOCHR      D1
DEC DE                         1B
LD A,D                         7A
OR E                           B3
JR NZ,SEARCH                   2099
LD A,C                         79
CP 00                          FE00
RET Z                          C8
JP NEXTGO                      C3D341
LD HL,(D-FILE)      SCORE1     2A0C40
LD DE,0018                     111800
ADD HL,DE                      19
CALL INCSC                     CD5641
RET                            C9
LD H,(D-FILE)       SCORE2     2A0C40
LD DE,0009                     110900
ADD HL,DE                      19
CALL INCSC                     CD5641
RET                            C9
```

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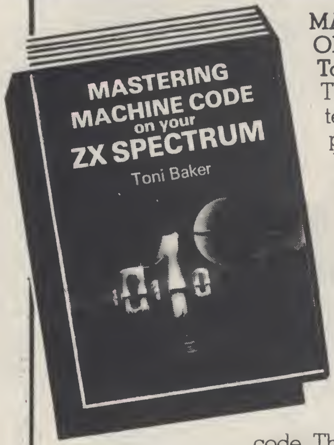

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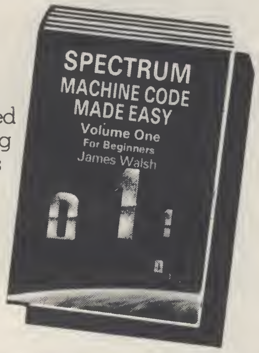

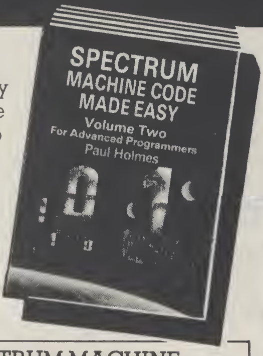

THE SPECTRUM MACHINE CODE REFERENCE GUIDE
Microdrive, Interface 1, and ROM Disassembly
Richard Ross-Langley £4.95

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Software selection

If you're looking for software for your ZX Spectrum computer, look no further than our comprehensive checklists.

What with Christmas coming up in a matter of weeks, you'll no doubt have thought of treating yourself to the odd software package for your ZX Spectrum. Well, if you've had a brief look through the adverts in the various computer magazines, you'll have discovered a wealth of software for you to choose from.

In this feature, un update of a checklist first published in the April/May issue of the *ZX Computing*, we have gathered together a comprehensive selection of titles currently available on the market. To help you further, you will also find the type of program, either Game (G), Business (B), Domestic (D), Utility (U) or Educational (E), the company you should contact and the price of the cassette. At the back of the listings, you will find a list of all the companies mentioned, complete with an address at which further enquires can be made.

Apologies

If you supply software cassettes and you do not find your products mentioned in these lists, please write to *ZX Computing*, marked for special attention of the Editor, and when it comes around to updating this feature for a future issue, we will be able to include your software titles.

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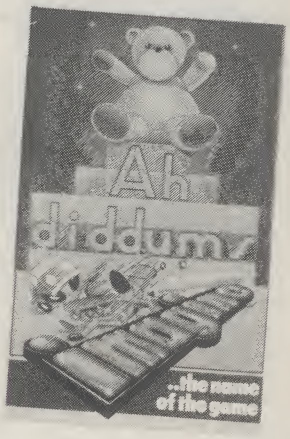

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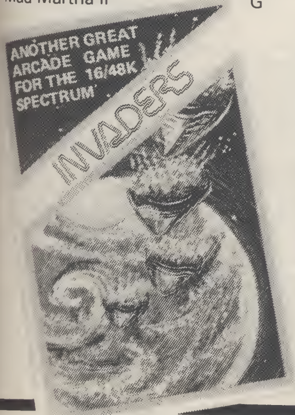
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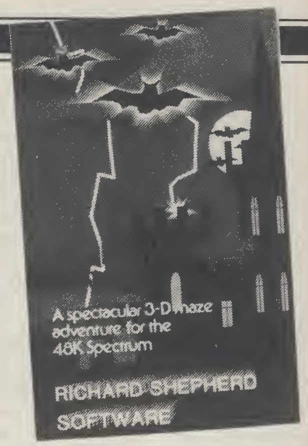
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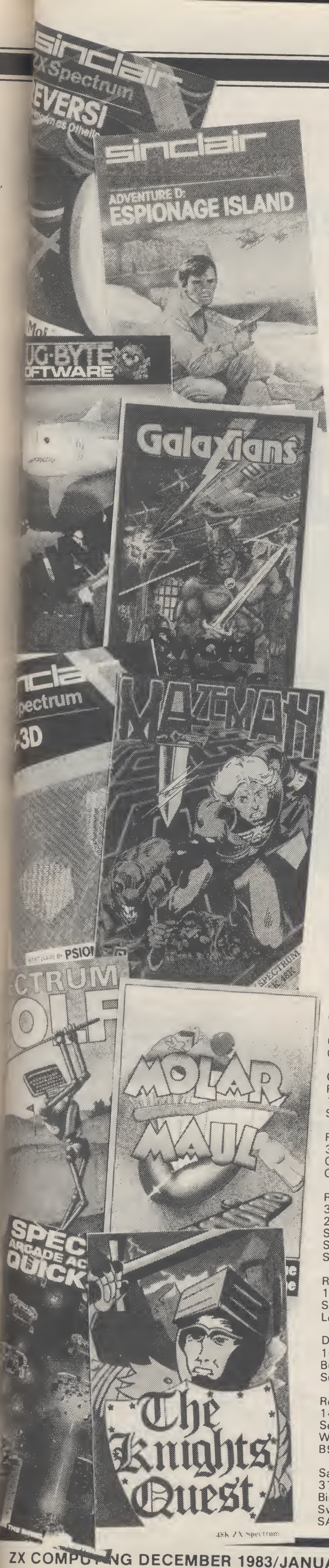

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In this game, you control a rabbit running around inside a maze full of dots. The object of the game is to eat all the dots in the maze, scoring a point for each dot your rabbit character manages to eat.

The maze also contains a jumping dog which tries to chase the rabbit around the maze. Should the dog catch the rabbit character, the game will end.

There are four different mazes which represent varying levels of difficulty. When you hve completed one maze full of dots, you will be presented with a new one.

Line by line

Here is a brief breakdown of the program highlighting the structure:

Lines 1-25	Initialise the game and call the subroutines for the instructions and for defining the user-defined graphics.
Lines 30-238	Draw the maze and call the subroutine for setting the difficulty.
Lines 240-470	Move the rabbit and the dog.
Lines 1000-1110	End the game.
Lines 2000-2060	Set the level of difficulty.
Lines 3000-3120	Contain the instructions.
Lines 4000-4130	Define the user-defined graphics.
Lines 5000-5100	Are only necessary when the program is SAVEd using the format 'SAVE ''RABBIT'' LINE 1'.

```
   1 BORDER 2: PAPER 1: INK 7: C
LS
   2 LET v=0: LET be=0: LET sc=0
   3 GO SUB 5000
   4 GO SUB 4000
   8 PRINT AT 10,0;"DO YOU WANT
INSTRUCTIONS?(y/n)"
   9 LET x$=INKEY$: IF x$="" THE
N GO TO 9
  10 IF x$="y" THEN GO SUB 3000
  11 CLS : PRINT AT 10,0;"WHAT L
EVEL DO YOU REQUIRE?(1-4)"
  12 IF INKEY$="" THEN GO TO 12
  13 LET e$=INKEY$
  14 IF e$<>"1" AND e$<>"2" AND
e$<>"3" AND e$<>"4" THEN GO TO 1
2
  15 DIM b(20,31)
  17 BORDER 2: PAPER 7: INK 0: C
LS
  18 LET i=2
  19 LET l=16: LET c=22: LET p=0
  LET u=0: LET tot=203: LET w=1
  20 LET m=1: LET n=7
  25 IF sc=tot THEN LET v=v+1
  30 PRINT AT 0,0;"     ████████
████████████"
  40 PRINT "     ██.......██....
...██"
  50 PRINT "     ██.███........█
██.██"
  60 PRINT "     ██.....██████..
...██"
  70 PRINT "     █..███...██...█
██..█"
  80 PRINT "     █......█....█..
....█"
  90 PRINT "     ███..█.██..██.█
..███"
 100 PRINT "     █......██..██..
....█"
 110 PRINT "     █.█.█..██..██..
█.█.█"
 120 PRINT "     ...............
....."
 130 PRINT "     █.█.█..██..██..
█.█.█"
 140 PRINT "     █......██..██..
....█"
 150 PRINT "     ███..█.██..██.█
..███"
 160 PRINT "     █......█....█..
....█"
 170 PRINT "     █..███...██...█
██..█"
 180 PRINT "     ██.....██████..
...██"
 190 PRINT "     ██.███........█
██.██"
 200 PRINT "     ██.......██....
...██"
 201 PRINT "     ███████████████
█████"
 210 PRINT AT 20,8;"RABBIT RABBI
T"
 220 PRINT AT 9,25; INK 1;" "
 221 PRINT AT 9,4; INK 1;" "
 225 IF VAL e$>1 THEN GO SUB 200
0
230 PRINT AT 0,25; PAPER 6; INK
1;"BEST "
231 PRINT AT 1,25; PAPER 6; INK
1;"00000"
```

```
 235 PRINT AT 0,0; PAPER 6; INK
1;"SCORE"
 236 PRINT AT 1,0; INK 1; PAPER
6;"00000"
 237 PRINT AT m,n; INK 4;"R";AT
l,c; INK 4;"P"
 238 PAUSE 100
 240 LET a=ATTR (m,n)
 241 IF w=0 THEN PRINT AT m,n; I
NK 3;"Q"
 242 IF w=1 THEN PRINT AT m,n; I
NK 4;"R"
 243 PRINT AT l,c; INK 1;"P"
 245 LET x=l: LET y=c
 246 LET g=m: LET h=n
 247 IF w=0 THEN LET w=1: GO TO
249
 248 IF w=1 THEN LET w=0
 249 IF l=m AND c=n THEN GO TO 1
000
 250 IF INKEY$="5" THEN LET c=c-
1
 260 IF INKEY$="6" THEN LET l=l+
1
 270 IF INKEY$="7" THEN LET l=l-
1
 280 IF INKEY$="8" THEN LET c=c+
1
 281 IF INKEY$="x" THEN CLS : GO
 TO 1010
 285 IF l<>x OR c<>y THEN PRINT
AT x,y; INK 1;" "
 290 LET z$=SCREEN$ (l,c)
 300 IF z$=" " AND ATTR (l,c)<>5
7 AND ATTR (l,c)<>58 THEN LET l=
x: LET c=y
 301 IF c=4 THEN LET c=24
 302 IF c=25 THEN LET c=5
 303 IF l=m AND c=n THEN GO TO 1
000
 305 LET b(l+1,c)=1
 310 IF z$="." THEN LET sc=sc+1:
 BEEP .002,0
 331 LET p=u
 335 LET u=sc+(v*tot)
 342 IF u-10000<0 THEN LET q=1
 343 IF u-1000<0 THEN LET q=2
 344 IF u-100<0 THEN LET q=3
 345 IF u-10<0 THEN LET q=4
 350 IF p<>u THEN PRINT AT 1,q;u
 380 IF sc=tot THEN GO TO 11
 381 IF u>be THEN LET be=u
 382 IF be-10000<0 THEN LET z=1
 383 IF be-1000<0 THEN LET z=2
 384 IF be-100<0 THEN LET z=3
 385 IF be-10<0 THEN LET z=4
 386 PRINT AT 1,25+z;be
 400 IF l>m THEN LET m=m+1
 410 IF l<m THEN LET m=m-1
 415 LET w$=SCREEN$ (m,n)
 416 IF w$=" " AND ATTR (m,n)<>5
6 AND ATTR (m,n)<>57 THEN LET m=
g
 420 IF m=g AND c<n THEN LET n=n
-1
 430 IF m=g AND c>n THEN LET n=n
+1
 435 LET i=0
 437 LET b$="."
 438 IF b(g+1,h)=1 THEN LET b$="
"
 439 IF b$=" " THEN LET i=1
 440 IF m<>g OR n<>h THEN PRINT
AT g,h; INK i;b$
 450 LET w$=SCREEN$ (m,n)
 460 IF w$=" " AND ATTR (m,n)<>5
6 AND ATTR (m,n)<>57 THEN LET n=
h
 465 LET f=0
 470 GO TO 240
1000 PRINT AT l,c; INK 4;"R": FO
R p=12 TO 51
1001 BEEP .05,p
1002 NEXT p
1005 CLS : PRINT AT 5,2; FLASH 1
; PAPER 1; INK 6;"RABBIT STEW FO
R DINNER AGAIN"
1010 PRINT AT 11,0;"PRESS y TO P
LAY AGAIN,n TO EXIT"
1015 PRINT AT 10,10; FLASH 1;"YO
U SCORED ";u
1020 IF INKEY$="y" THEN GO TO 11
1030 IF INKEY$<>"n" THEN GO TO 1
020
1040 CLS
1100 PRINT AT 10,10; FLASH 1; PA
PER 2; INK 7;"** BYE **": GO TO
1100
1110 STOP
2000 REM Change maze
2010 PRINT AT 5,12;".";AT 5,17;"
.";AT 13,12;".";AT 13,17;".": LE
T tot=207
2020 IF e$="2" THEN RETURN
2030 PRINT AT 4,14;"..";AT 14,14
;"..": LET tot=211
2040 IF e$="3" THEN RETURN
2050 PRINT AT 9,5;"█";AT 9,24;"▒
": LET tot=209
2060 IF e$="4" THEN RETURN
3000 CLS
3010 PRINT AT 0,10;"INSTRUCTIONS
"
3020 PRINT AT 2,0;"   The object
 of the game is to   eat all the
 dots in the maze,   without bei
ng eaten by the dog  first.There
 are four levels     of difficul
ty(1-4)."
3030 PRINT AT 8,2;"THE RABBIT(yo
urself)...P"
3040 PRINT AT 10,2;"THE DOG(up a
nd down)...Q&R"
3050 PRINT AT 12,2;"CONTROLS"
3060 PRINT AT 14,5;"Left.....5"
3070 PRINT AT 15,5;"Right....8"
3080 PRINT AT 16,5;"Up.......7"
3090 PRINT AT 17,5;"Down.....6"
3095 PRINT AT 18,5;"Press x to e
xit at any time"
3100 PRINT AT 20,5;"TO START PRE
SS ANY KEY"
3110 IF INKEY$="" THEN GO TO 311
0
3120 RETURN
4000 FOR n=0 TO 7
4010 READ row: POKE USR "P"+n,ro
w
4020 NEXT n
4030 FOR n=0 TO 7
4040 READ row: POKE USR "Q"+n,ro
w
4050 NEXT n
4060 FOR n=0 TO 7
4070 READ row: POKE USR "R"+n,ro
w
4080 NEXT n
4100 DATA 32,46,40,64,56,84,68,5
5
4110 DATA 6,7,24,62,178,64,160,1
50
4120 DATA 0,0,70,135,248,120,72,
72,0
4130 RETURN
5000 PRINT AT 1,9; INK 1; PAPER
5; FLASH 1;"STOP THE TAPE"
5005 PRINT
5010 FOR n=1 TO 19
5020 PRINT TAB n; FLASH 1;"RABBI
T"
5030 NEXT n
5040 PRINT AT 8,15;"PRESS ANY KE
Y TO"
5050 PRINT AT 9,20;"BEGIN"
5060 IF INKEY$="" THEN GO TO 506
0
5070 CLS
5100 RETURN
```

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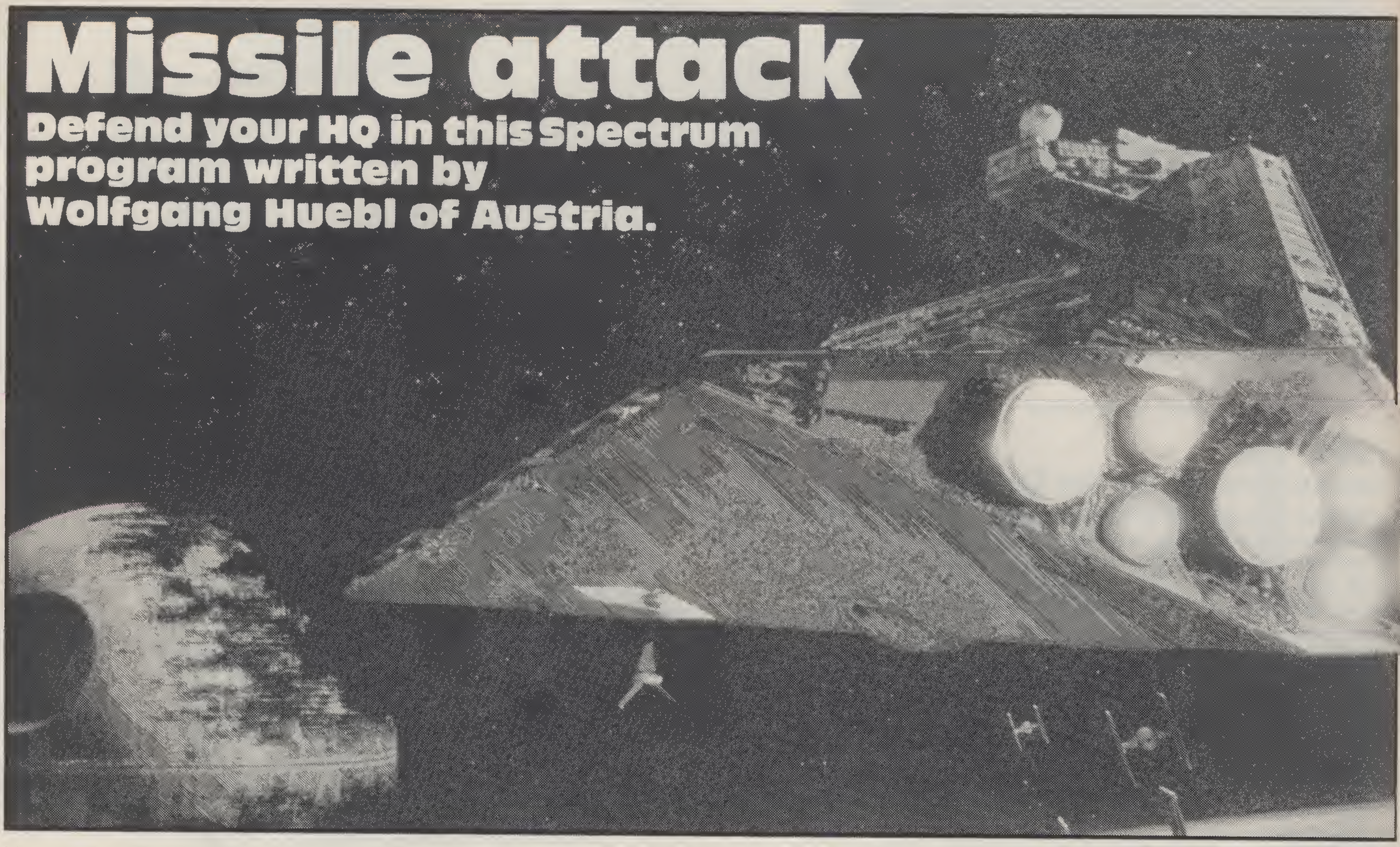
Missile attack

Defend your HQ in this Spectrum program written by Wolfgang Huebl of Austria.



Your aim in this game is to defend the Moonbase HQ against a missile attack from the alien invaders.

When you first run the program, you are presented with two sheets of instructions explaining the operation of the game. Then, you will be invited to press the 'o' key to begin the game.

Misile madness

When the game is first set up, you will see the commander of the moonbase within the HQ block perched at the precipice of a moon-crater. At the bottom of the screen is a ray gun which fires diagonally across the screen. It is your job to fire the ray gun at the missiles which cross the screen from left to right to stop them reaching the HQ.

There are two different types of missile, black and yellow, and these can only be destroyed with the right kind of death ray from your ray gun. You must press the 'p' key to fire a death ray to destroy the black missiles and the 'q' key to destroy the yellow missiles. You get one shot at each missile so don't waste your shots!

If you manage to hit one of the missiles, there is one second BEEP and the word 'HIT!' appears on the screen near to where the missile was destroyed. You score one point for each black missile you shoot down and two points for each yellow missile; if two missiles are shot down simultaneously, you score six points although if you miss either of them you will score no points at all!

Should you miss a missile, it will continue on its path and cause destruction to the HQ if the alien invaders' aim was right in the first place. If the HQ is destroyed leaving a path for a missile to get through and hit the commander of the moonbase, the game will end.

There are three skill levels pertaining to the various scores you must reach before the alien invaders stop firing missiles at your HQ. On level one, you must achieve more than 30 points; on level two, you must get 50 points; and on level three, you must destroy missiles worth 70 points before the enemy give up.

Line by line

Here follows a breakdown of the program for you to get a better idea of what is going on:

Lines 10-25, 1000	Contain the routine to set the user-defined graphics.
Lines 30-80	Contain a routine to print brief instructions and to choose the skill level.
Lines 105,106 and 500	Contain the routine which selects the random numbers to decide what will go where.
Lines 107-170	Contain a routine to make a missile fly and also to allow you to take a shot at it.
Lines 200-250	Contain a routine which destroys a portion of the HQ should a missile hit it.
Lines 300-350	Contain a routine to make a missile fly and also to react if it hits anything in its path.
Line 500-575	Contain a routine to make two missiles fly at once and also to allow you to shoot at them.
Lines 700-830	Contain a routine to make two missiles fly at once and also to react if they hit anything in their path.
Line 900	Contains a routine which reacts when a missile hits the commander of the moonbase.

Variables

Here follows a list of the main variables used throughout the program:

d	Data used for the user-defined graphics.
l	Skill level (1,2 or 3).
z	Score (0 to 75).
h	Height at which the HQ is put (varies according to skill level).
s	Determines how many shots the player has got (0,1 or 2).
yand y2	Determines the line on which the missile flies.
xand x2	Determines the column at which the missile is or shall be printed or erased.
f	Determines the colour of the missile.
e	ATTRibute of missile's last position.
a	ATTRibute of missile's new position.
e0	Determines whether the black missile is still existing or has been destroyed, has hit the target or is already off of screen.
e2	Same as e0 but for the yellow missile.

```
 10 FOR n=0 TO 39
 20 READ d: POKE USR "A"+n,d
 25 NEXT n
 30 BORDER 5: PAPER 5: CLS
 40 PRINT AT 0,7; INK 1;"█████
█████████"'AT 1,7; PAPER 6; INK
 1;"█MISSILE ATTACK█"'AT 2,7; IN
K 1;"████████████████"
 50 PRINT "Defend your Moonbase
-HQ(and yourlife) against a miss
ile attack"
 52 PRINT : PRINT "Use your ray
-gun to destroy the missiles"
 54 PRINT : PRINT "Shoot down t
he black missiles with your p-ra
ys(press p to shoot)and gain one
 point"
 56 PRINT : PRINT "Use your q-r
ays to shoot at the yellow ones(
press q to shoot)""A hit adds t
wo to your score"
 58 PRINT : PRINT "Sometimes yo
u'll face 2 missilesat once.By h
itting both  you'll gain 6 point
s"
 60 PRINT : PRINT "Press any ke
y to continue"
 62 IF INKEY$="" THEN GO TO 62
 64 CLS : PRINT "If a missile h
its your HQ a part of the protec
tion shield will  disintegrate"
 66 PRINT : PRINT "If you are h
it the game is over"
 68 PRINT : PRINT "Choose skill
-level now(press 1,2 or 3)"
 70 LET l$=INKEY$
 71 IF l$<>"1" AND l$<>"2" AND
l$<>"3" THEN GO TO 70
 72 LET l=VAL l$
 74 PRINT "Level ";l;":"'"You'l
l need ";10+20*l;" points to  ma
ke  the enemy give up"
 76 PRINT : PRINT "You have onl
y one shot  for one missile"
 78 PRINT : PRINT "Press o to s
tart the game"
 80 IF INKEY$<>"o" THEN GO TO 8
0
 101 BORDER 1: PAPER 5: LET f=0:
 CLS
 102 LET z=0: LET h=12-l: PRINT
AT 0,0;"Level ";l: DRAW INK 5;57
,16: PRINT AT 20,6;"CD": PRINT A
T 21,5;"████": PRINT AT h,29; INK
 2;"███": PRINT AT h+1,29; INK 2
;"██";: PRINT INK 1;"A": PRINT A
T h+2,29; INK 2;"██";: PRINT INK
 1;"B": PRINT AT h+3,29; INK 2;"
███"
 104 IF ATTR (18,8)=47 THEN DRAW
 INK 5;150,150: DRAW INK 5;-150,
-150
 105 IF INT (RND*5)>3 THEN GO TO
 500
 106 LET s=1: LET x=INT (RND*z/(
3-l)): LET y=8+INT (RND*8): LET
f=6*INT (RND+0.25)
 107 PRINT AT y,x; INK f;"E"
 130 IF s=1 AND INKEY$="p" THEN
DRAW 150,150: BEEP 0.01,40: DRAW
 INK 5;-150,-150: LET s=0
 140 IF s=1 AND INKEY$="q" THEN
DRAW 150,150: BEEP 0.01,30: DRAW
 INK 7;-150,-150: LET s=0
 144 LET e=ATTR (y,x)
 145 IF f=0 AND e=45 THEN GO TO
200
 147 IF f=6 AND e=47 THEN GO TO
200
 150 PRINT AT y,x;" ": LET x=x+1
 160 IF x>28 THEN GO TO 300
 170 GO TO 107
 200 BORDER 6: PRINT AT 10,17; I
NVERSE 1; FLASH 1; INK 2;"HIT!":
 BORDER 1
 205 BEEP 1,-20: LET z=z+1+f/6
 206 IF z>=10+20*l THEN BORDER 4
: PRINT AT 10,7; FLASH 1;"ENEMY
GIVES UP": PRINT AT 20,12;"Final
 Score:";z: FOR b=0 TO 10: BEEP
.3,b: NEXT b: STOP
 207 PRINT AT 10,13;"          ":
 PRINT AT 20,22;z
 210 PRINT AT y,x;" "
 250 GO TO 104
 300 LET a=ATTR (y,x)
 308 IF a=41 THEN PRINT AT y,x;
INK 0;"█": GO TO 900
 310 IF a<>40 AND a<>45 THEN PRI
NT AT y,x; INK 6;"█": BEEP 0.5,-
5: PRINT AT y,x; INK 5;"█": GO T
O 104
 320 PRINT AT y,x; INK f;"E"
 325 LET x=x+1
 330 PRINT AT y,x-1;" "
 340 IF x=32 THEN GO TO 104
 350 GO TO 300
 500 LET f=0: LET e0=1: LET e2=1
: LET s=2: LET x=INT (RND*5): LE
T x2=INT (RND*5): LET y=8+INT (R
ND*8): LET y2=8+INT (RND*8)
 505 IF x=x2 AND y=y2 THEN GO TO
 500
 510 IF e0<>0 THEN PRINT AT y,x;
"E"
 520 IF e2<>0 THEN PRINT AT y2,x
2;"E"
 530 IF s>0 AND INKEY$="p" THEN
DRAW 150,150: BEEP 0.01,40: DRAW
 INK 5;-150,-150: LET s=s-1
 540 IF ATTR (y,x)=45 THEN LET e
0=0
 550 IF ATTR (y2,x2)=45 THEN LET
 e2=0
 555 PRINT AT y,x;" ": PRINT AT
y2,x2;" "
 560 LET x=x+1: LET x2=x2+1
 570 IF e0=0 AND e2=0 THEN LET z
=z+5: GO TO 200
 575 IF x>28 OR x2>28 THEN GO TO
 700
 580 GO TO 510
 700 IF (e0=1 AND ATTR (y,x)=41)
 OR (e2=1 AND ATTR (y2,x2)=41) T
HEN GO TO 900
 720 IF e0=1 AND ATTR (y,x)<>40
AND ATTR (y,x)<>45 THEN PRINT AT
 y,x; INK 6;"█": BEEP 0.5,-5: PR
INT AT y,x;" ": LET e0=0
 740 IF e2=1 AND ATTR (y2,x2)<>4
0 AND ATTR (y2,x2)<>45 THEN PRIN
T AT y2,x2; INK 6;"█": BEEP 0.5,
-5: PRINT AT y2,x2;" ": LET e2=0
 743 IF e0<>0 THEN PRINT AT y,x;
"E"
 746 IF e2<>0 THEN PRINT AT y2,x
2;"E"
 748 LET x=x+1: LET x2=x2+1
 780 IF e0<>0 THEN PRINT AT y,x-
1;" "
 790 IF e2<>0 THEN PRINT AT y2,x
2-1;" "
 800 IF x=32 THEN LET e0=0
 810 IF x2=32 THEN LET e2=0
 820 IF e0=0 AND e2=0 THEN GO TO
 104
 830 GO TO 700
 900 BEEP 1,-40: PAPER 6: CLS :
PAUSE 50: PAPER 2: CLS : PRINT A
T 10,10; FLASH 1;"YOU ARE DEAD":
 PRINT AT 21,20;"SCORE: ";z: FOR
 b=0 TO -40 STEP -2: BEEP 0.2,b:
 NEXT b: STOP
1000 DATA 0,6,6,2,14,150,230,254
,230,230,230,230,230,230,230,238
,0,1,3,7,14,28,56,255,224,192,12
8,0,0,0,0,0,0,192,254,255,254,19
2,0,0
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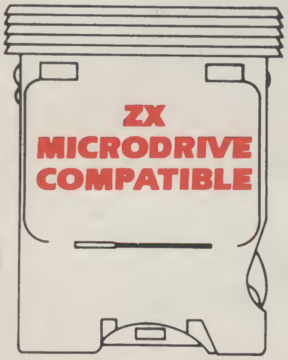

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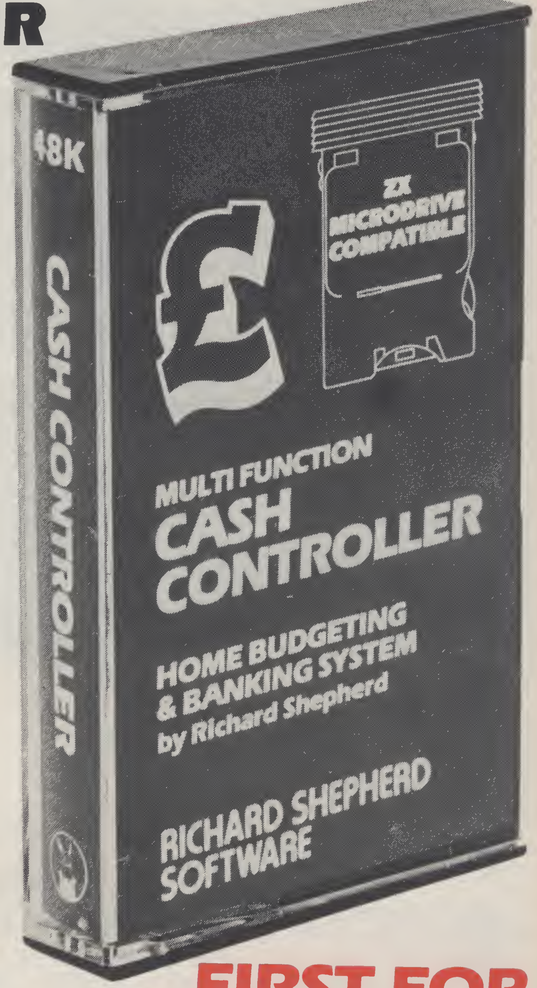

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MACHINE SPECIFICATIONS

ZX80

Dimensions

Width 174mm (6.85 in)
Depth 218mm (8.58 in)
Height 38 mm (1. 5 in)
Weight 300g (10.5oz)

Microprocessor/Memory

Z80A 3.25 MHz clock
ROM: 4K bytes containing BASIC
RAM: 1K bytes internal, externally expandable to 16K bytes.

Display

Requires an ordinary domestic black and white colour TV. The lead supplied connects between the ZX80 and your TV's aerial socket. The display organisation is 24 lines of 32 characters per line showing black characters on a white screen. The ZX80 does not connect to a printer.

Programming

Programs can be entered on the keyboard or loaded from cassette. The ZX80 has automatic "wrap round" so lines of program can be any length but not multi-statement lines.

Syntax check

The syntax of the entered line is checked character by character. A syntax error cursor marks the first place the syntax breaks down if there is an error. Once any errors have been edited out the syntax error cursor disappears. Only syntax error-free lines of code are accepted by the ZX80.

Graphics

Total of 22 graphics symbols giving 48 x 64 pixels resolution consisting of 10 symbols plus space and inverses. Includes symbols for drawing bar charts. Under control of your BASIC program any character can be printed in reverse field.

Editing

The line edit allows you to edit any line of program or input including statement numbers. The edit and cursor control keys are EDIT, RUBOUT, HOME.

Arithmetic

Arithmetic operators +,–,x, ÷ exponentiate. Relational operators <, >, = , yielding 0 or – 1. Logical operators AND OR NOT yielding boolean result. Relational operators also apply to strings. ZX80 BASIC uses 16 bit two's complement arithmetic (± 32767).

Variables

Numeric variable names may be any length, must begin with a letter and consist of alphanumerics. Every character in the name is compared thus an infinity of unique names is available.

String variables may be assigned to or from, shortened but not concatenated. String variable names are A$ – Z$. Strings do not require a dimension statement and can be any length.

Arrays have a maximum dimension of 255 (256 elements) each. Array names consist of a single letter A–Z.

Control variable names in FOR. . . NEXT loops consist of a single letter A–Z.

Expression evaluator

The full expression evaluator is called whenever a constant or variable is encountered during program execution. This allows you to use expressions in place of constants especially useful in GOTOs, GOSUBs, FOR. . . NEXT etc.

Immediate mode

The ZX80 will function in the "calculator mode" by immediately executing a statement if it is not preceded with a line number.

Cassette interface

Works with most domestic cassette recorders. The transfer rate is 250 baud using a unique tape-recording format. Other systems are not compatible with the ZX80's. The ZX80 also SAVEs the variables as well as the program on cassette. Therefore you can save the data for updating next time the program is executed. The ZX80 does not support separate data files. The lead supplied with the ZX80 is fitted with 3.5mm jack plugs.

Expansion bus

At the rear has 8 data, 16 address, 13 control lines from the processor and Ov, 5v, 9-11v, $\overline{\phi}$ and internal memory control line. These signals enable you to interface the ZX80 to your own electronics, PIO, CTC, SIO if you want I/O ports etc.

Power supply

The ZX80 requires approximately 400mA from 7–11v DC. It has its own internal 5v regulator.

TV standard

The ZX80 is designed to work with UHF TVs (channel 36)and is the version required for use in the United Kingdom. The ZX80 USA is designed to work with a VHF TV(American channel 2. European channel 3) and is the version required for the American TV system, also for countries without UHF.

ZX81

Dimensions

Width 167mm (6.32 in)
Depth 175mm (6.80 in)
Height 40 mm (1.57 in)
Weight 350 gms (12.15 oz)

Microprocessor/Memory

Z80A 3.25 MHz clock
ROM: Containing 8K BASIC interpreter
RAM: 1K bytes internal, externally expandable to 16K bytes.

Keyboard

40 key touch-sensitive membrane. Using function mode and single press key-word system, this gives the equivalent of 91 keys and also graphics mode allows an additional 20 graphical and 54 inverse video characters to be entered directly.

Display

Requires an ordinary domestic black and white or colour TV. The aerial lead supplied connects the ZX81 to the TV aerial socket. The display is organised as 24 lines of 32 characters with black characters on a white background.

Two mode speeds

The ZX81 can operate in two software-selectable modes - FAST and NORMAL. FAST is ideal for really high-speed computing. In NORMAL mode however the ZX81 allows continuously moving, flicker-free animated displays.

Printer

The 8K ROM will permit instructions (LPRINT, LLIST and COPY) to drive the Sinclair ZX Printer.

Programming

Programs can be entered via the keyboard or loaded from cassette. Programs and data can be saved onto cassette so that they are not lost when the ZX81 is turned off.

Syntax check

The syntax of a line of program is checked on entry. A syntax error cursor marks the first place the syntax breaks down if there is an error. The syntax error cursor disappears when errors have been corrected. Only lines free from syntax errors will be entered into the program.

Graphics

Apart from the 20 graphics characters, space and its inverse, the display may also be divided into 64 x 44 pixels, each of which may be 'blacked' in or 'whited' out under program control.

Editing

A line editor allows you to edit any line of program or input, including program line numbers. Lines may be deleted, increased or decreased in size.

Arithmetic

Arithmetic operators +, –, x, ÷, exponentiate. Relational operators =, < >, >, <,< =,>=, may compare string and arithmetic variables to yeild 0 (False) or 1(True). Logical operators AND, OR, NOT yield boolean results.

Floating-point numbers

Numbers are stored in 5 bytes in floating-point binary form giving a range of $\pm$ 3 x $10^{-39}$to $\pm$ 7 x 10^{38}accurate to 9½ decimal digits.

Scientific functions

Natural logs/antilogs; SIN, COS, TAN and their inverses;SQR; e^x.

Variables

Numerical:	any letter followed by alphanumerics
String:	A$ to Z$
FOR-NEXT loops:	A–Z (loops may be nested to any depth.
Numerical arrays:	A–Z
String arrays:	A$ to Z$

Arrays

Arrays may be multi-dimensional with subscripts starting at 1.

Expression evaluator

The full expression evaluator is called whenever an expression, constant or variable is encountered during program execution. This powerful feature allows use of expressions in place of constants and is especially useful in GOTO, GOSUB etc.

Command mode

The ZX81 will execute statements immediately, enabling it to perform like a calculator.

Cassette interface

Works using domestic cassette recorders. The transfer rate is 250 baud and uses a unique recording format not compatible with other systems. The ZX81 will save the data as well as the program to avoid the need to re-enter the data when the program is next loaded.,

ZX81 will search through a tape for the required program). The cassette leads supplied have 3.5 mm jack plugs.

Expansion port

At the rear, this has the full data, address and control buses from the Z80A CPU as well as OV, +5V, +9V,$\overline{0}$ and the memory select lines. These signals enable you to interface the ZX81 to the Sinclair 16K RAM pack and ZX printer.

Power supply

The ZX81 requires approximately 420mA at 7–11V DC. It has its own internal 5V regulator. The ready assembled ZX81 comes complete with a power supply. The ZX81 kit does not include a power supply.

TV standard

The ZX81 is designed to work with UHF TVs (channel 36) 625 lines.

ZX SPECTRUM

Dimensions

Width 233 mm
Depth 144 mm
Height 30 mm

CPU/Memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.
16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-key keyboard with upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

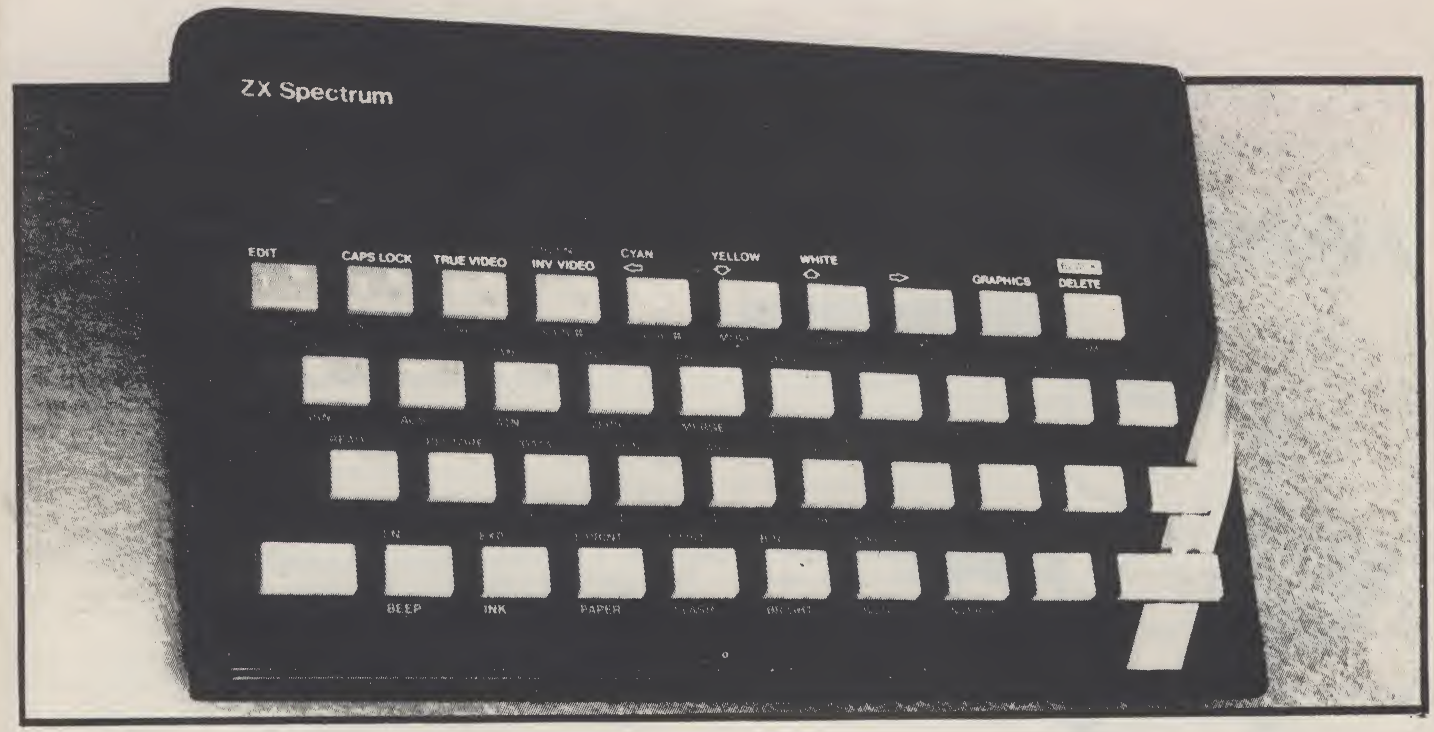
Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive — or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magneta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section — normally the first 22 lines — displays the program listing or the results of program or command execution. The bottom section — normally the last 2 lines — shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.



Mathematical Operations And Functions

Arithmetic operations of +, −, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generation, and pi.

Numbers are stored as five bytes of floating point binary — giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String Operations And Functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code. A string slicing mechanism exists, using the form a$ (x TO y).

Variable Names

Numeric — any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).

String — A$ to Z$.

FOR-NEXT loops — A-Z.

Numeric arrays — A-Z.

String arrays — A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression Evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette Interface

A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion Port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives. IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 Compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

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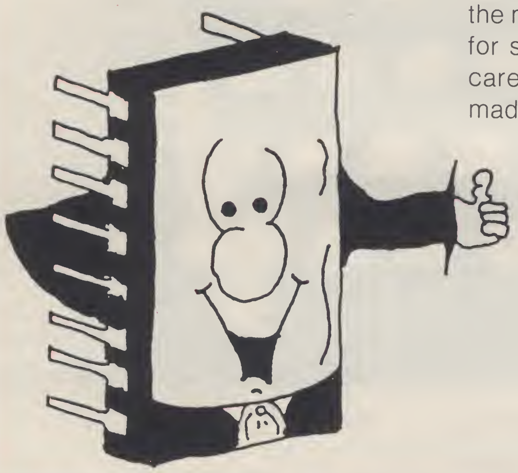

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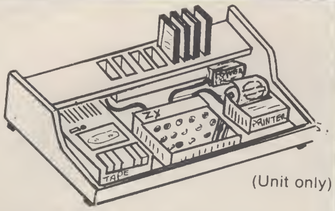

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